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THOSE who looked forward to another first-class mystery in connection with the explosion of the boiler of the Riverdale are doomed to disappointment. The boiler was simply excessively corroded, and could not stand the strain of more than ordinary pressure.

NOBEL'S gelatine dynamite is beginning to find its place in rock-blasting, and the indications are, that its principal field will be in the hardest ground, where its greater power fully comes into play, thus counterbalancing its increased cost. In softer ground, much of its power is wasted in shattering the rock, the quantity of material blasted out not being great enough to compensate for its higher cost; and in some cases, where smalls are objectionable, being actually injurious.

THE completion of the Northern Pacific Railroad will, we are convinced, mark the beginning of an era of prosperity to the mining interests, notably of Montana. The industry which will be most directly and immediately benefited is copper mining and smelting in the Butte District. With increased outlets to market and better facilities for procuring fuel, the cost of production and of marketing ought to be materially reduced, and the Butte smelter be better than ever able to compete in the markets of the world.

THE Franklin Institute, of Philadelphia, has taken a step worthy of its past history and present high standing. It proposes to arrange for the holding of an international electric exhibition on the 3d of September, 1884. The great success of the Paris and Vienna exhibitions gives all the encouragement the enterprise deserves. Though probably visited by many Americans, and though closely watched by the American press, the two exhibitions referred to have not, it must be acknowledged, done much toward diffusing a knowledge of current progress among our own people. This, we feel sure, will be fully accomplished by our Philadelphia friends.

IN a well-meaning article on that hackneyed subject, "Is Mining a Legitimate Business?" the *Western Manufacturer*, of Chicago, with the object of illustrating a point, quotes a note on the Ray Copper Company, of Arizona, and then ventures the following rash opinion: "The probabilities are, that the whole territory of Arizona will not produce $5,000,000 worth of ingot copper in the next ten years." Let our Western friends take a slate and go to work with the following figures as a basis: Last year, Arizona mines produced seventeen millions of pounds of copper, worth, say, on an average, 16 cents per pound. This year, the insignificant mines of that poor territory will probably turn out not less than twenty millions of pounds, bringing in the New York market say fourteen cents per pound. Total, $5,520,000 estimated value. Had not the *Western Manufacturer* better multiply its figures by five, or, better still, abstain from writing on a subject with which it is not familiar?

A NOVEL method of sinking through ground carrying large bodies of water is now attempted at the Archibald mine, near Schneidlingen, Germany, by Herr H. POETSCH, of Aschersleben. He freezes the water. After sinking the shaft through 34 meters of dry ground, he struck the quicksand, and, beginning on the 9th of July with a temperature of the earth of 11 degrees Celsius, he had chilled the ground to 5 or 6·5 degrees below the freezing-point, the temperature of the strata in the center of the shaft being + 4 degrees. According to the latest accounts, working through the frozen material was to begin at an early date. It is possible that, under certain favorable conditions, such a process of preliminary freezing of the water-bearing ground may prove successful; but we doubt its efficiency in any case where the water is under any pressure, small though it may be.

MR. J. S. JEANS, Secretary of the British Iron Trade Association, has issued a statement showing that, for the first half of 1883, the production of pig-iron in Great Britain was 4,138,225 tons, against 4,252,042 gross tons during the second half of 1882, and 4,241,245 tons during the first half of that year. This indicates a slight falling off, which is also noted in the stocks, which are stated to have been 1,315,775 tons on the 30th of June, against 1,368,854 tons in the beginning of the year. In many respects, this exhibit resembles that by which Mr. SWANK attempted to show that we are rapidly getting down to a sound basis. As with us, there is an evident movement in the right direction; but its force is not great enough to carry the trade out of the lethargy into which it has fallen.

TECHNICAL TRAINING.

The most important contribution recently made to the discussion of technical education is the address of Dr. T. M. DROWN, delivered June 20th, 1883, before the Alumni Association of Lehigh University, by whom it has been printed in pamphlet form for distribution among those interested in the subject. This address is not only graceful and appropriate in form, but also full of felicitous observations—we might well say epigrams—which, like so many gleams of lightning, both strike to the heart of the subject and reveal with sudden illumination a comprehensive view of it. It contains a treatment of the question from the stand-point of a notably skillful and successful educator, who is himself, at the same time, equally distinguished as a practical expert and investigator. Dr. DROWN speaks with so much authority that his opinion would go far to settle the whole debate, but for the circumstance that his special point of view is that of analytical chemistry, both the science and the art of which occupy a peculiar position, not in all respects comparable with that of the engineering branches. That is to say, the "shop" of the analytical chemist is the laboratory; and in the laboratory of instruction he can and does

perform the same operations as in the subsequent laboratory of practice. But Dr. DROWN'S familiarity with other branches of applied science is not inconsiderable; and moreover, his position as Secretary of the American Institute of Mining Engineers has given him special opportunity to watch the careers of school graduates as well as of self-educated, or wholly shop-educated, engineers. Perhaps nobody in the country could estimate fairly, in a general way, the professional standing and success of a larger number of engineers, chemists, and metallurgists.

Dr. DROWN takes strong ground in favor of distinct spheres for the technical school and the workshop. He does not believe in teaching the practice of an art in the school. His broad proposition is, that nothing should be taught in the schools which can be better taught in the field or the shop. Whether the practical should precede or follow the theoretical instruction, he does not positively say; but the drift of his argument shows pretty clearly that he thinks the student should go from the school to the shop or the field.

Not less earnest is his plea for separating the technical school from the curriculum of general culture. He would have the special teaching of engineering, chemistry, etc., be, like the special teaching of law or medicine, a distinct and a supplementary course. In this he is quite right. Some parents may be obliged by poverty to omit the bestowal of a liberal education upon their sons, and to thrust them at once into the immediate preparation for bread-winning. We would not reproach such victims of necessity. But it should be clearly understood that such defective education is an evil; and when they who take this road presume to praise it as the best, they intensify the evil into a nuisance.

Dr. DROWN offers also a timely criticism upon the cramming process which threatens to swamp our technical schools, and by which the aspirant to a degree is made nominally proficient in a dozen different branches, all of which are indeed pertinent and useful, but can not be mastered by one mind in one course of three or four years, now that each branch has been, in the swift progress of this generation, developed into a science by itself. As he justly remarks, "We must be reconciled to the necessity of becoming specialists, and of calling in other specialists to help us. Perhaps the most we can hope for is to be an expert in one department, and to know enough of the related departments to judge of the harmony and fitness of the combined work of many heads and hands."

It is this irresistible tendency toward specialization which makes the scientific and technical courses of the present day such poor substitutes for the full, liberal course, so far as the general culture of the mind is concerned. They do not widen the sympathies and extend the associations. Their natural effect is rather to narrow and intensify the mental activities. If a man is not to become a specialist and nothing more, he must have received, before entering upon his professional training, a culture which will have developed and strengthened tastes and powers capable of resisting the influence of the technical school.

Dr. DROWN'S description of that function of the school which puts the student "into synchronous motion with the science he is studying," is peculiarly happy. But it evidently applies to the analytical chemist preeminently; to the physical tests of materials in a smaller degree; and to general engineering scarcely at all. His idea is, that the technical school should be the center of original investigation and experiment; and that this is one of the best possible elements of instruction. This is true enough in chemistry and physics. It has been successfully proved by GIBBS, DROWN himself, and other notable teachers of chemistry; and that part of the address before us which dwells upon it is an interesting revelation of the methods of a famous educator. *

A NEW BRANCH OF ENGINEERING.

A need of which the American public in general, and many individuals and corporations in particular, have been for some time keenly yet vaguely aware, is the service of men capable of giving expert advice on all matters connected with the management of forests. On all sides, we hear that something must be done with regard to the timber supply and the waning forests of the country. Congresses are held; associations are formed; and innumerable "cranks" ventilate their theories and plans. Meanwhile, in certain localities and for certain industries, timber grows steadily scarcer and dearer; and land-owners, with the best will in the world, seeing that they can not afford systematic forest planting and culture after elaborate foreign methods, and not knowing what else they can do, do nothing. Those who simply resolve not to cut down their forests are perhaps the most foolish of all; for there is a stage of growth at which forests should be cut down. And those who, after cutting, do nothing more, but leave the future to nature, find that nature presents them with worthless "scrub" material, instead of the valuable trees they have removed. Now, the all-important fact is, that without large expenditures, and without complicated administration after foreign models, a great deal can be done under present conditions with certain profit. But experienced foresters only can decide, when and what and how. Under the advice of such men, unskilled proprietors and laborers of merely ordinary intelligence and fidelity can accomplish much in the redemption and preservation of valuable timber-species.

In many parts of the East, notably in the anthracite regions of Pennsylvania, the question of mining-timber is a pressing one. The forests which have furnished it hitherto, many thousand acres of which are owned by the great anthracite companies, do not spontaneously renew themselves in satisfactory quality; and the lands themselves, after the forests have been cut, relapse into a worthless wilderness. In many such cases, the owners would no doubt willingly try to remedy this evil, if they could begin tentatively, and on a modest scale. It is not surprising that they are disinclined to launch at once into a grand experiment, and surrender themselves to the theories of enthusiastic naturalists or speculators. We are inclined to believe that, in the vast majority of cases, elaborate schemes of forestry will not pay. The time is coming, but it has not yet come, when slow-growing hard-wood forests can be planted and cultivated, so as to pay fair interest on the investment. There are, no doubt, localities where even this can be done with advantage; but a large part of the work of an expert adviser would probably consist in demonstrating to parties entertaining such schemes the premature character of that sort of work at present. On the other hand, the numerous things that could be, and ought to be, and are not, done by forest-owners, the doing of which would bear fruit at once in increased profits or increased reserves, or diminished waste and favorable renewal of timber-species, would furnish a field for practical advice of great immediate value.

Whoever undertakes to give such advice should be a thoroughly trained forester, familiar with what has been accomplished abroad, and also with what can be done here. Above all, he should understand our commercial conditions, and not be tempted to recommend what is not practicable on that side as well as on the side of technical arboriculture. We are glad to notice that this branch of engineering is now beginning to be represented in this country, and that, as an evidence of this new departure, an office has been opened in this city by Mr. BERNHARD E. FERNOW, whose contributions to various technical societies and to the *Charcoal Iron-Workers' Journal* and other journals have attracted general attention. His career as an official in the Prussian forestry service, and his residence of many years in the United States, where he has managed forest-lands, supply the requisites needed to qualify him as a prudent and safe adviser. The American Forestry Congress recently re-elected Mr. FERNOW as Corresponding Secretary; and in this capacity he is well known in the United States and Canada to the leading authorities in that line. The work of a few engineers with a thorough theoretical and business training will do more to meet existing evils and to organize a reform than endless discussion by amateurs, and for this reason we heartily welcome the pioneers of a new branch of engineering. *

A METHOD OF DISTRIBUTING WEATHER FORECASTS BY MEANS OF RAILROADS.

In a paper read before the American Association for the Advancement of Science, Mr. T. C. Mendenhall describes a system that has only been in operation in Ohio for about a year. To distribute forecasts, signals are placed upon the sides of the baggage-cars, as distinct as possible from each other, so as to be easily recognized at considerable distances, and also to convey as much meaning as possible, so as to predict as many different conditions. A combination of form and color was adopted. The signals are three in number as to form and two in number as to color. The red signals are confined to predictions as to temperature—rise in temperature, stationary temperature, falling temperature. The other color is blue, and that is confined to predictions in regard to the general state of the weather. The question of form was a good deal considered, and three forms were adopted. The sun, moon, and a star were chosen, because every body is familiar with those words. Experiments were made with the triangle, and finally rejected. The device for attaching to the car is due to Mr. Anderson, who has been in the service of the board of commissioners for the past year; and it is really a happy device. The signal is made as large as possible, and the disk can be seen at a long distance. The red sun and blue moon mean higher temperature and general rain. The crescent means lower temperature. The full disk of blue means general rain. The star represents local rains. With regard to the proper working of the system, though it has been in operation but a short time, it has really done good work. Special telegrams are received every morning, and they are transmitted to the train-dispatchers at five o'clock. As yet it is operated only on one railroad. It happens, fortunately, that that road goes through an agricultural region of considerable importance, connecting the cities of Columbus and Cleveland. Two trains start out in the morning at the middle point between those cities. The signals are put on the cars at five o'clock in the morning; and as they run through the morning hours, the farmers along the line can have an opportunity of seeing them and predicting the weather for the day. The railroad company circulated through the whole line little cards having these signals displayed in colors, with their meaning in every combination. This helps, because it enables every body to understand what is meant. A recent communication from General Hazen indicates a disposition on the part of the general government to take hold of the matter and bring it into general operation as far as possible. Postal cards have been sent to various persons along the line, with questions in regard to the practical working of the system, which are answered and sent in at the end of every week; and it has been found that on the average eighty per cent of the predictions are verified.

CORRESPONDENCE.

[Communications will be noticed only when accompanied with the full name and address of the writer. Unless specially desired, only initials will be printed. We invite criticism and comment by the readers of the ENGINEERING AND MINING JOURNAL. Replies not intended for publication should be addressed to the Editor of the ENGINEERING AND MINING JOURNAL in blank, stamped, and sealed envelopes. We do not hold ourselves responsible for the opinions of our correspondents.]

The Sulphur Compounds in Gas-Lime.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: While occasionally experimenting with gas-lime (from the purifiers of the Philadelphia gas-works), I have found that it is not constituted as I think is generally believed; and therefore it may be of interest to give the results of an analysis of it. The combinations to which I call attention are those of sulphur and also of cyanogen with lime. The latter, however, are present in very small quantities only; the combinations of sulphur form the greater part of the gas-lime. I will explain here, in what form and combination the sulphur and cyanogen are contained in the gas-lime, and how I came during my investigation to these conclusions.

I found sulphur, not, as I first expected, as sulphide, but in its free state, and especially as hyposulphite; and I found that the cyanogen combination is a sulpho-cyanide. The latter was found in small quantities in the solution, by treating the lime with cold water, filtering, and extracting with alcohol. The cold aqueous solution did not give the least reaction for sulphureted hydrogen, as it would do, to some extent, if sulphide of calcium were contained in the lime. It reacted for hyposulphurous acid, and was of alkaline nature.

I then boiled some gas-lime with water, and filtered. The solution had a yellow color and reacted for sulphurous acid and also for sulphureted hydrogen. There was no doubt that the hot aqueous solution now contained some sulphide of calcium and sulphite of lime; but the following tests prove that these were not contained in the gas-lime in the same forms before it was boiled, and show how they came to be found in the hot aqueous solution.

I took a quantity of the gas-lime, and boiled it with water and carbonate of soda, the latter a little in excess of the lime. By this treatment, the combinations of lime with sulphur, as sulphide (if such be present) and the hyposulphite, will be converted into carbonate of lime and sulphide and hyposulphite of sodium. If sulphide of sodium be present, the solution should give, after filtering, the reaction for sulphureted hydrogen; but this it did not do; which showed conclusively the absence of sulphide of sodium in the solution, and consequently the absence of sulphide of calcium in the lime: the solution contained hyposulphite of soda. To assure myself of this, I made counter-experiments with sulphide of calcium and carbonate of soda, which gave the reaction for sulphureted hydrogen in the filtrate, as also sulphide of calcium treated with cold water gives a plain reaction for the same. But how could the lime show the reaction for sulphureted hydrogen, thereby proving the presence of sulphide, after having been *boiled* with water only? This is explained by the following facts: Hyposulphite of lime is, when boiled, converted into sulphite and free sulphur; the gas-lime itself contains free sulphur and some caustic lime, and these, when boiled, are partially converted into sulphide of calcium, having the formula CaS_5. In the presence of carbonate of soda, the action of sulphur on the lime and the formation of this sulphide is excluded, and the sulphur is kept in its free state, while carbonate of lime is formed; and hyposulphite of lime is converted into hyposulphite of soda and carbonate of lime.

In the quantatitive analysis of the gas-lime, it is necessary to determine water, free sulphur, insoluble matter, alumina (and iron), silica, sulphocyanide of lime, hyposulphite of lime, carbonate and caustic lime. Free sulphur is extracted with bisulphide of carbon. A portion of the lime being treated with alcohol, the evaporated filtrate will show the amount of sulpho-cyanide of lime. The lime is brought into solution by hydrochloric acid; some insoluble matter is left; the solution contains all the lime, alumina (and iron), and silica, all of which can be determined by weight. To determine the hyposulphurous acid, the gas-lime must be boiled with water and carbonate of soda, filtered, and the hyposulphurous acid determined in the solution volumetrically with iodine. Carbonic acid will be found by adding to the gas-lime a solution of chromate of potash, and then gradually nitric acid, until all carbonic acid is driven out: the difference in aggregate weight of the apparatus, lime-solution, chromate of potash, and nitric acid, before and after the evolution of carbonic acid, is the amount of the latter. The difference between the whole lime and that combined with hyposulphurous and carbonic acid is the amount of caustic lime.

The result of the analysis was the following:

Water	9·793
Insoluble matter	3·562
Sulphur (free)	3·782
Alumina (and iron)	4·401
Silica	3·559
Hyposulphite of lime	49·343
Carbonate of lime	21·260
Caustic lime	2·417
Sulpho-cyanide of lime	2·150
	100·267

PHILADELPHIA, Aug. 28. ADOLF GLEIM.

Belt Copper Mines, Limited.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: We are not, as a rule, in the habit of noticing anonymous communications; but we trust you will allow us, on this occasion, to reply to a communication signed "Specular," referring to the above mines, which appeared in your issue of the 28th of July last. We are unaware of the object which has prompted this and other similar communications which have recently appeared in various local American periodicals; and we are anxious, as the consulting engineers to the company, and those, therefore, primarily responsible, to correct various inaccuracies in it, the chief of which is an insinuation that the present stockholders were induced to invest in the undertaking under what, it is implied, were virtually misrepresentations.

Although the spirit of the communication would lead a casual reader to infer that the writer was intimately acquainted with the property, it is easy to deduce that the information embodied in it has been obtained second-hand.

We are content to pass over the philanthropic spirit by which your correspondent professes to be animated, and even to thank him for the compassion which he is good enough to express for the misguided British investors who have been beguiled into so unpromising a venture; but, in justice both to the original vendors and to ourselves, we must energetically protest against the insinuation conveyed in his letter, that the present stockholders were induced to invest in the enterprise under false representations, which, according to his letter, could only have emanated from American sources.

It is only fair to the mining element of the peninsula to point out that no American experts were employed on behalf of the company to report upon the property, and that it was simply and purely acquired on the recommendation of English mining engineers, after an exhaustive examination made by our firm, in conjunction with one of the best-known mining experts on this side of the Atlantic; so that, whatever the future of the mine may be, we, together with the gentleman just referred to, and we only, are responsible for its acquisition by British capitalists.

In order to protect themselves so far as possible, the directors of the company, previous to taking over the property, applied to the Royal School of Mines in this city to nominate a responsible firm of engineers; and we had the honor of being named by that institution to examine into the resources of the mine and check the reports made by the American experts. Our examination proved satisfactory, and the capital was subscribed chiefly from private sources.

The stockholders knew from the first that the property was almost a virgin one, and that the amount of work done was relatively insignificant; but they were satisfied with our opinion that the veins, where opened up, were strong, persistent, well-defined, and fairly productive, and that, given the necessary time and money, there was no reason why the mine should not develop into as good a property as any of those lying around the shores of Portage Lake. To this opinion, confirmed by a recent and exhaustive examination of the mines, we still adhere.

During the visits referred to, we discussed the possible future of the Belt mines with many of the oldest and most experienced miners of both the Houghton and Ontonagon districts, and the unanimous opinion of those best qualified to judge was, that no reason existed to prevent the Belt mines from proving as productive as their great rivals on the more easterly portion of the peninsula.

It was generally admitted that, while most of the great mines in the Houghton District had enjoyed the numerous advantages derivable from a sufficiency of funds, those in Ontonagon County had been started in the majority of instances with insufficient capital, and compelled to draw their financial supplies from the mines themselves, which, never having been sufficiently developed, finally collapsed from pure inanition, due to want of capital.

We may call your attention to the patent fact, that the principal fault your correspondent finds with the mines is, that they were badly worked and managed in former times; a state of things which it will be little to our credit if we can not reform. The comparison between the daily output of a mine like the Quincy and that of a property on which no work has been done for a long series of years does not call for further notice.

Respecting the points to which a practical miner would attach importance, there is hardly a reference in your correspondent's letter. A brief remark that some person or persons unknown considered the ore was too lightly charged to pay for working, virtually covers the whole question of mining and production.

We may point out that the plant of hoisting and compressed-air machinery for which he intimates "preparations are making," has been at work since February last; that a drift was commenced from a shaft on the Knowlton vein long prior to the present company resuming operation; and that the depth of the shaft on the Bohemian was 180 feet, instead of less than 60 feet, as asserted by him.

The closing remarks of your correspondent are condemnatory of the enormous outlay of capital which is taking place, a criticism somewhat difficult to reconcile with his prediction, in the preceding paragraph, that, at the present rate of development, it is hopeless to expect any thing at all from this property for two years to come. We trust soon to be in a position to offer a practical refutation to this remark.

In conclusion, we again protest against the effort of your correspondent to sow the seeds of discord between the mining interests of two sister nations. Whatever the final result may be, we are content, as we have said, to accept a responsibility which we gladly welcomed from the first.

With a sufficiency of capital to enable us to tide over even a prolonged period of development, an able and industrious staff, and with, as we believe, as good a mine in prospect as any on the peninsula, we await the issue with every confidence in its ultimate success. We are, sir, your obedient servants, BAINBRIDGE, SEYMOUR & RATHBONE.

WESTMINSTER, 2 GREAT GEORGE STREET, Aug. 21, 1883.

THE WAYS THAT ARE QUEER OF JAPANESE MINERS.—Japanese miners have some curious customs which sadly depreciate the value of their work. They do not appear to appreciate the fact that "time is money." An engineer who has just returned from the mines of that country tells us that they light them in a peculiar manner. Every man entering the mine carries with him a large bundle of from five to six-foot bamboo cane, slightly beaten before use. This cane is used as a torch. It burns fairly well for a few seconds until a notch is reached, when the light nearly goes out and the ashes must be knocked off, a process which must be repeated every half-minute. Every six or seven minutes, a new cane must be lighted, so that a good share of the miner's time is occupied in keeping his illumination in a fairly satisfactory condition. Unfortunately, Japanese miners are, besides, great smokers, and they use a pipe having a bowl the capacity of which is equal to that of an ordinary thimble. It takes two whiffs to finish it, when the process of filling up and lighting it must be gone through. Every one has probably had occasion to watch the great deliberation with which an average Irishman, when at work, will fill his clay bowl when the foreman's gaze is not on him; but imagination simply shrinks from the task of picturing the rapid progress of work intrusted to a smoking Japanese miner.

NOTES ON THE EXHIBITION AT DENVER.—II.

Special Correspondence of the Engineering and Mining Journal.

THE BOULDER COUNTY EXHIBIT.

The exhibits in this section represent about two hundred mines, and the richness of the display stands unrivaled in the Exhibition. There are numerous specimens showing solid pieces of gold as large as a five-dollar piece, and nuggets of pure native silver weighing pounds, besides a fine collection of specimens of that ore second only to native gold, namely, telluride of gold. In the cases are shown the finer picked specimens of ore from the various mines; while in another compartment there are large blocks of ordinary ores, to indicate that the mines are good producers of quantity as well as quality.

The Grand Island District has a very rich show in the cases, in which the following mines take part: Caribou, Poor Man, Seven-Thirty, and St. La Sare. These mines exhibit native silver as wire and nugget, pure silver-glance, and beautifully crystallized brittle silver (stephanite), also ruby silver, rich galena, gray copper ore and arsenite, and nearly all the silver-bearing copper and lead ores. The next case is occupied by high-grade telluride and free gold ores from the Sugar Loaf, Gold Hill, and Central districts. The principal mines represented are the Slide, Prussian, Smuggler, Richmond, Malvina, New Enterprise, Keystone, Mountain Lion, Grand View, and others. There are free gold ores from the Richmond and the Smuggler worth $120 and $70 per pound respectively. A case full of tellurides from the New Enterprise mine is shown which run from $50 to $70 per pound. Another lot of ore, high-grade galena, comes from the Roman Eagle mine, Jamestown. The Black Cloud, in the same district, exhibits some medium pay ore in good-sized blocks, consisting of sulphurets of copper, lead, and zinc, containing $120 per ton of silver and gold. The Buck Horn, which is celebrated as the first mine that started the so-called Jimtown rush, shows some blocks of $70 silver ore with 50 per cent lead as galena.

The Ward District, embracing the Columbia, Celestial, Morning Star, Baxter, and Ny Wot mines, shows some blocks of gold-bearing pyrites. Some fine specimens of copper pyrites are exhibited by a mine in Pennsylvania Gulch, containing $180 silver and 37 per cent of copper. Among the large blocks not in the cases are some splendid lumps of galena from Caribou, assaying from 300 to 500 ounces of silver per ton; also, similar pieces from Poor Man and Black Cloud. There is a quantity of a very fine magnetite ore, also from Caribou mine, which contains a vein of it no less than 40 feet thick. A splendid and curious specimen of galena intermixed with pink fluor-spar is shown; also $40 gold ore from the Pewabic mine, Jamestown. There are four blocks of gray copper ore from the Yellow Pine mine, one of the largest in Colorado, which ore runs from 400 ounces of silver per ton. The blocks weigh altogether about 2000 pounds, and are grand specimens, being literally filled with the ore. The Richmond mine, being determined to contradict the knife-blade theory applied to the Boulder County tellurides, has sent a block to show the width of the pay-streak. It is a foot or more wide and three feet long, and is full of telluride associated with mispickel. The Marshall Coal Company shows some large blocks of the lignite coal worked near the Boulder, apparently of good quality; also, some specimens of good building-stone from the same locality.

GILPIN COUNTY.

This county has a small stand exhibiting some splendid blocks of gold and silver-bearing galena and copper and iron pyrites. A large obelisk, the column colored gold and the base silver, graphically represents in mass the gold and silver mined since 1859, and given as gold, $35,500,000, and silver, $2,850,000; while last year, $2,290,000 gold and $250,000 silver were obtained.

PUEBLO COUNTY.

The exhibit of this county is chiefly of a manufacturing character. Although, as is well known, it contains considerable mineral wealth, it is much of it undeveloped, and unquestionably its chief attraction is in that wonderful, mushroom-like growth called Pueblo, which only three years ago contained but 3000 souls, while now it is claimed that there are at least 20,000 in the combined towns. Here, a vast center of manufacturing industry is rapidly forming, and already it can boast of two colossal enterprises for the treatment of the various ores containing the precious metals, and steel and iron-works which promise to reach large proportions in the future. Indeed, the facilities which Pueblo offers to manufacturers are very great. Her railroad connections are already extended directly northward, eastward, and westward, and will soon be opened to the south, and this by no mere monopoly, but by means of railroads between which there is severe competition. The only exhibits shown at present of any consequence are those of the Pueblo Smelting and Refining Company, the Colorado Coal and Iron Company, and the Colorado Machinery Company, mentioned before. Twenty-four thousand pounds of refined and manufactured lead are shown by the former, consisting of sheet, rod, and tube lead, and the exhibit has excited much favorable comment from Eastern manufacturers and merchants. The second-named company exhibits a collection of its products, namely, steel rails, blooms, and bars, with various sized nails of good quality. The raw materials used are also shown, but come chiefly from the neighboring county, Fremont. One large block of pure magnetite weighing about 1000 pounds is especially fine. The exhibit is fenced in by steel rails twisted closely when cold, and which do not show a single crack or flaw. These exhibits are highly important, as showing that, by the investment of capital, the State need not go out of its own border for many things which both had and have to be imported at great cost from the East.

OLD MEXICO.

Among the latest additions are some most magnificent and valuable specimens of ruby, brittle, and native silver. They are Batopilas ores from the Roncesvalles and San Miguel mines. Among them are specimens showing silver to the value of $25,000 per ton. One is especially worthy of notice, being a large sheet of native silver fully one quarter of an inch thick.

A small collection of carbonate ores, from Carbonate, the new camp in Garfield County, is shown, but is too small for special mention. The Union Pacific Railroad has a very fine exhibit of specimens, chiefly of a mineralogical character, and taken from the various mining districts penetrated by the railroad. There are some fine specimens of fossil palm-wood, generally incrusted on the interior with large crystals of quartz, and in some cases azotized. The specimens are seldom labeled, unless we except the cards printed with the imperious mandate, "Hands off!" so worthy of this company. The Richmond & Danville Railroad has also lately appeared with its splendid display of the riches to be found along its route; but this exhibit has already been shown twice in the East, and has doubtless been described before this by an abler pen. It is more calculated to draw capital away from us than to attract it.

MONTANA TERRITORY.

Mr. J. B. Read, the Commissioner for this exhibit, has kindly furnished me with the following particulars about the mines which are represented here, and which I may say are chiefly situated in the Butte District. The Bell mine is 400 feet down in its new shaft, where the vein measures from 8 to 24 feet thick, and is all pay ore. A splendid block was shown weighing over 200 pounds, and covered with native silver, containing about $250 worth of it, and 50 per cent of copper. The mine has a 60-ton smelter in operation, and ships 10 tons of matte per day. The Lexington is 500 feet deep, and is a silver and gold-bearing quartz-vein, a true fissure in granite. It has 60 stamps in operation. The output from January 1st for seven months has been $742,000. The ore pulps $55 per ton. The mine showed some splendid specimens, many containing visible native silver. The Moulton mine also shows specimens of silver ore from a shaft 500 feet deep, and supplies a forty-stamp mill abundantly with ore. The Alice mine is one of the biggest and best. It is 800 feet deep, and keeps an eighty-stamp mill going, giving a gross output of $90,000 per month. The Anaconda is well known, and by many is considered the second best copper mine in the world after the Calumet & Hecla. The ore is a very rich sulphide (copper glance). The company is putting in machinery costing $90,000, a 500-ton smelter being part of it. There is a 40-foot vein of solid ore carrying from 20 to 70 per cent of copper.

The following mines, also reported here, have the following developments: Colusa, 400 feet deep; ore, copper and silver; 100-ton smelter. Parrott, 300 feet deep; ore, copper; produces 75 tons per day; 75-ton smelter. The Boston & Colorado smelter is also situated there, and does a large business. This district produced $7,200,000 in silver, gold, and copper last year. The Drum Lummon mine is one of the richest mines in this territory, though not in the Butte District. It was sold for $1,500,000 this year. It is to be regretted that, through a disagreement with the authorities, the fine exhibit of this mine should be now lying packed up.

Among the machinery exhibits are several useful machines shown by Fraser & Chalmers. Especially worthy of mention is the splendid Corliss engine which supplies the motive-power for the various machines in motion. There is a Frue vanning machine, also shown in operation, and, being next to the Embrey, gives a good opportunity to study the comparative merits of the two machines. A working model of a mill is shown, which is destined—so many think—to a great run in the near future. It is called the Sturtevant mill, and crushes on a different principle from the ordinary mills for this purpose. The lumps of ore are thrown against each other by two heads revolving at an enormous speed in opposite directions, thus grinding each other. There is an arrangement by which all the ore which will not pass through a 40 mesh is returned until fine enough, and a dust-chamber is attached by which the dust, of which there is a considerable quantity, and which would otherwise be lost, is retained. The company, which has works at Boston, has only one mill in operation as yet. It claims that it pulverizes 2½ tons per hour. It is situated at the Bowker Fertilizing Company's works, Brighton, Mass. It has, however, received several orders since starting here a week ago, and many good authorities have spoken highly of the machine.

DENVER, Sept. 1. A. COPELAND.

FRENCH MINING STATISTICS.

From the Bureau of the Minister of Public Works, has been recently issued a statement of the iron and coal production of France up to the end of 1881, which shows both in that and the previous year some amount of increase. The total yield of iron ore for 1881 was 3,689,000 tons, an increase of five per cent over that of 1880, which was less by 158,000 tons. The production of Algeria was 657,000 tons for 1881, an increase of 43,000 tons. Iron ore is worked in France in thirty-three departments, half of the whole amount (1,796,000 tons) being furnished by the department of Meurthe-et-Moselle. Next comes Ardeche, with 197,000; Haute Marne, 169,000; Saone-et-Loire, 162,000; Pyrenees Orientales, 133,000. Besides the increase in production, there has been a similar increase of importation from Algeria, Spain, Germany, Italy, and Belgium, the total amount being 1,287,000 tons, 119,000 more than in the previous year. The consumption of iron ore during 1881 in the various smelting-works was 4,231,000 tons, of which 6 per cent came from Algeria, and 24 per cent from foreign sources. The production of coal, anthracite and lignite, for the year was 19,766,000 tons, an increase of 582,000 tons over that of the previous year. The departments of Nord and Pas-de-Calais figure for 8,992,000 tons, followed at a respectable distance by the Loire coal-basin, with 3,616,000 tons; Gard, with 1,933,000 tons; Burgundy and Nivernais, 1,552,000 tons; Tarn and Aveyron, 1,080,000 tons; Bourbonnais. 961,000 tons. All these minor coal-fields have fallen off in their production, and the increase of the year is solely due to Nord and Pas-de-Calais. The import of fuel into France for 1881 was 10,221,000 tons, of which 5,386,000 tons came from Belgium, 3,569,000 tons from England, and 1255 tons from Germany. Coal importation has been steadily increasing for several years in France, that of 1872 being only 7,709,000 tons. The exports of coal are very small, and are as steadily decreasing, having been 603,000 tons in 1880 and 601,000 tons in 1881. The peat fuel industry is also on the decrease; for in 1872, the working of peat bogs amounted to 325,000 tons, and in 1881 to but 233,000 tons. Peat is, however, still largely used, there being upward of 1073 recognized peat-beds in the state, on which are 8400 separate workings, employing about 26,000 hands.

THE DISCOVERY OF TIN-STONE IN THE BLACK HILLS OF DAKOTA.

Written for the Engineering and Mining Journal by William P. Blake, F.G.S.

The discovery of tin ore in the Black Hills of Dakota Territory may be said to have been complete on the seventh of June, 1883, when a sample which had been forwarded by Capt. A. J. Simmons, of Rapid City, Dakota, to General Gashwiler, of San Francisco, was submitted to me for determination. This sample was an irregular fragment, weighing about half a pound, evidently broken from a larger mass. It was dark-colored, very heavy, and had no appearance of crystallization, and did not resemble any of the ores of tin which had come under my observation. It had, however, the hardness of cassiterite, and the characteristic powder or streak. Under the blow-pipe flame, upon charcoal, an abundance of globules of white malleable tin left no reason to question that the ore was mainly the oxide of tin, the mineral species known as cassiterite, which, when pure, contains over 75 per cent of metallic tin.

The fragments were more or less mixed with a feldspathic gangue or vein-stone, and some of them were incrusted with a bright green-colored coating, which resembled the crusts of emerald nickel, but which before the blow-pipe were found to consist mainly of copper carbonate. A quantitative assay of an average sample showed the presence of 40 per cent of metallic tin.

Other samples were telegraphed for, and, on their arrival, I found, in addition to the massive cassiterite, some brown and black ores, having the appearance of columbite, of ilmenite, and of wolfram, and also, a fragmen tinvoiced as "log-spar," which I at once recognized as a fragment of spodumene.

On the 25th of July, I visited the locality and made a full examination of it, and gave a short preliminary notice of the discovery in the September number of the *American Journal of Science.*

THE LOCALITY.

The discovery is in the central portion of the Black Hills, in Pennington County, about twenty miles southwest of Rapid City, two miles from Harney City, and a few miles east of Harney Peak on the backbone or dividing range of the region. It is upon a claim known as the Etta, on a mountain which I have named Tin Mountain, and is at an elevation of about 4300 feet above the sea. Harney Peak, the highest summit of the Black Hills, has an altitude of 7403 feet, according to the survey of Messrs. Newton and Jenney.

This Tin Mountain is in the midst of a very rugged country, and is drained by the tributaries of Battle Creek, one of the largest streams of the Hills. But although the peaks and ridges are rugged, the intervening spaces are comparatively smooth and open, and permit the construction of roads at small expense. The wagon-road from Harney extends up the creek to the cabins on the claim at the foot of the peak of the mountain. There is a thick growth of pine timber over the whole region, and there is an abundance of pure water in springs and in running brooks. The rocks, the vegetation of the valleys, and the climate all remind one of the mountainous parts of Northern New England.

THE GEOLOGY.

The Black Hills, rising like an island in the broad expanse of the plains, are everywhere surrounded by the outcropping edges of the sedimentary formation from the base of the Silurian upward to the Tertiary so far as they exist at the West. These formations dip gently away on all sides from the central nucleus of more ancient rocks, which rise up in a multitude of irregular peaks and broken ridges with a general northerly and southerly trend. These rocks consist chiefly of fine-grained mica-schist and micaceous sandstones, traversed by veins of quartz, which are often auriferous, although the quartz has that peculiar glassy, barren look which is seen in the quartz veins of New England, and appears utterly unpromising for the precious metal. The slates in some portions are highly charged with small brown garnets, forming perhaps twenty per cent of the mass, so that the rocks may be said to be garnet slates rather than mica slates. There is also an abundant development of staurolites and of staurolite slate. Lithologically considered, these rocks remind the geologist of portions of the White Mountain series of formations, and are probably the equivalents of the Coos group of formations, as described by Prof. Charles H. Hitchcock, of New Hampshire. By the geologists Newton and Tenney, in their Report on the Black Hills, the mica-schists of the whole region are referred to the Huronian period; and in the preliminary notice of the discovery of tin ore in Dakota, this view was accepted. Further examination of the rocks and a consideration of the subject require a modification of this opinion, and a reference of the rocks—at least, those which abound in garnets and staurolites—to the later period. There is a sufficient breadth of formation, however, to include all the formations—the Huronian as well as the Coos and later rocks. They may also be called Montalban. No limestone beds were observed, and the magnesian rocks appear to be absent.

Toward the central portion of this area of mica-schists, granitic intrusions make their appearance, and rise in rugged peaks in the midst of the slates. These granitic masses are remarkable for the extreme coarseness of their crystallization; the constituent minerals being unusually large and separately segregated. Large masses of pure quartz are found in one place and masses of feldspar in another, and the mica is often accumulated together, instead of being regularly disseminated through the mass. It also occurs in large masses or crystals, affording sheets broad enough for cutting into commercial sizes. This occurrence of mica has led to considerable prospecting of the region for mica, and numerous claims have been located and worked. This quarrying for mica on the Etta claim brought the heavy black tin ore to notice; for Tin Mountain, where it occurs, is one of these intruded masses of coarse granite. The word intruded is here used considerately; for the phenomena fully justify this conclusion as to the origin of the granite. The surrounding schists are not greatly metamorphosed from their original condition, and the transition from schist to coarse granite is sudden. These micaceous and garnetiferous schists of the Black Hills have been subjected to an enormous amount of crushing and compression, by which they have been folded and crumpled to a remarkable degree. The longer axes of these folds and wrinkles, instead of being approximately horizontal, as is usual, are, on the contrary, nearly vertical or are highly inclined. The troughs of the strata thus stand nearly on end. It results from this folding and upheaval that the structure or grain of the rocks, so far as it is imparted by the folding, is nearly vertical and at the same time is convoluted, and in consequence the formations, in wearing away by erosion and disintegration and decay, are left with a peculiarly uneven surface, presenting a succession of pointed hills and peaks rather than a series of nearly parallel ridges. This folded structure is the basis of the peculiar topography of the country. It is the cause of it. Even the quartz veins partake of the folding, as may be seen by their serpent-like outcrops, and become columnar masses extending to great depths, while their internal extension appears to be comparatively limited. This is true also of the granitic intrusions. They appear as columnar bunches rather than sheet-like veins. The structure indicates a double folding, first horizontally then vertically. These phenomena, although apparently occult and purely scientific rather than of any "practical" significance or importance, have, nevertheless, in this case particularly a direct economical and money value. They go to show that the veins which, with their schistose walls, are so crumpled up, have a great downward extension. They probably extend much deeper than their lateral extension would indicate. In fact, this is not merely a deduction from the structural form, but it is made evident to the eye by a close inspection of any of the outcrops of the schists in which quartz veins occur. If a fragment of quartz is broken out from such outcrops, its form is found to be columnar and approximately cylindrical. So also the slates break out in columnar masses, and not in flat sheets.

The gold-bearing rocks of the Deadwood region have a similar structure, and the paying portions are controlled by or follow the pitch of the folds; which pitch or inclination is not so steep as at the tin region. The granite intrusions coming to the surface form bosses or knobs, and Tin Mountain has this form, being nearly surrounded by the schistose rocks.

MINERALOGY.

The cassiterite occurs near the top of the granite mountain, and apparently occupies a central or core-like position. The massive variety is in close association with feldspar, quartz, and spodumene, while a granular form is disseminated in a massive micaceous albitic rock or greisen, which traverses the coarse granite in the form of irregular veins or bunches.

There are thus two distinct forms of occurrence of the tin ore at Tin Mountain:

1st. Massive in bunches, with spodumene, feldspar, and quartz.

2d. Granular, disseminated in a micaceous aggregate or greisen.

In the massive form, the ore is associated chiefly with the spodumene, which here attains an unusual size. It is not only in direct contact with the spodumene, but actually penetrates it, so that it appears to partly replace portions of the crystals. One of the specimens, weighing 1¼ pounds, is two thirds tin-stone and the remainder spodumene. Another specimen exhibits the tin-stone traversing the spodumene irregularly. Besides this penetration or replacement by massive ore, it is not unusual, on cleaving a mass of spodumene, to find small, flattened grains of cassiterite in the body of the crystal, often mere stains or patches on the cleavage surfaces. In this form, it has the appearance of being a secondary deposition.

Of the massive form of the ore, about one ton of fragments has been taken out. Some of the heavier masses weighed from fifty to sixty pounds. Lumps weighing three and four pounds are common. Most of the larger masses were broken by the miners. They were in fact too heavy to handle with ease. No distinct crystalline faces on these masses have yet been observed. There are small quantities of copper oxide in crusts as already described, and some mispickel has been seen, but does not appear to be an abundant or a constant associate. It is not found in the greisen, the tin ore being apparently the only metalliferous constituent in that aggregation. The ore requires a careful qualitative and quantitative analysis, which there have not yet been time and opportunity to obtain. The specific gravity of selected fragments apparently free of gangue or associated minerals, is 6·753. The streak is brownish-gray. The massive tin ore was first encountered in sinking a pit for mica, and was followed down in irregular bunches for about 15 feet, to the bottom of what is now an open cut.

The granular or disseminated form of the tin ore appears to be the most abundant and constant. The micaceous aggregate in which it occurs consists of a mixture of small scales of mica and of albite, also in small or granular masses, or in plates radially aggregated. The dominant mineral is the mica, which is in crystalline plates seldom over half of an inch across, but is without well-defined lateral planes. Its color is light greenish-yellow. It is dense and hard, and some of the plates are sufficiently clear and transparent to permit of the measurement of the inclination of the optic axes, which was found to be, in air, from 75·30 degrees to 76 degrees. This high angle and the association of the mineral with tin ore and spodumene suggested the reference of the mica to lepidolite; but no satisfactory reactions for lithia can be obtained with the blow-pipe. The weathered surfaces resemble those of the Zinnwald lepidolite, being dark colored and showing the edges of the crystals. The mass weathers well and stands out above the other minerals. It crops out boldly at intervals over the whole top of the mountain for a breadth of 100 feet or more, and penetrates the coarsely crystalline mass formed of orthoclase feldspar, quartz, and spodumene as if it had a separate and later origin, either by intrusion or segregation. The grains often occur irregularly disseminated, sometimes at the base of an aggregation of mica crystals, at the junction with the white-spar, and again it is found more sparingly in the midst of the mica crystals in thin, flattened, transparent plates, recalling to mind the inclusion of plates of tourmaline in the sheets of muscovite mica of New Hampshire and other localities. When in such thin plates, the color by transmitted light is a light clove-brown. Such small crystals are easily detached by splitting the mica plates.

The mineralization of this albitic greisen with tin ore is general throughout the mass; at least, the tin ore can be found wherever the micaceous aggregate crops out, as is shown by breaking off masses from projecting points. But when large blocks of the rock have been blasted out, as in the open cut, and fresh surfaces are exposed, the amount of ore in different parts of the mass is seen to vary considerably, and the size of

the grains of tin-stone also varies. The size of the grains most abundant is generally under one quarter of an inch in diameter. Masses are, however, found from one half to an inch in diameter, constituting in such masses more than half the weight. The proportion of albite is also variable, and the mixture presents somewhat different aspects when broken from different places, but generally the fracture shows a very brilliant, uneven surface of alternate patches of the white-spar, mica crystals, and black grains of tin-stone. The mica has a splendid silvery luster.

This albitic greisen differs from the typical greisen of the French in having albite with the mica instead of quartz, though the general appearance and mineralization with the tin ore are the same.

The greisen of France is described by M. Manhès, and later by M. Mallard in the *Annales des Mines*, sixième série, x. 325, as formed of irregular fragments of mica and of quartz appearing in the mass like a puddingstone. It occurs at the tin mines of Vaulry, France, and is regarded as the same in origin as the veins. The tin ore of this locality occurs both in thin veins traversing granite in a schistose region, and also disseminated in the greisen.

A specimen of greisen from France, the precise locality of which is not known, greatly resembles the Black Hills greisen, but is finer in grain, the mica crystals being smaller and more irregular, and densely packed together. There is no albite, but quartz is irregularly mixed with the mica.

It is interesting to note, also, the fact that tin ore occurs similarly in New South Wales. Some of the deposits are described as micaceous dikes, with tin ore plentifully distributed in grains from the size of a pea downward. One of the dikes forms a breccia of mica and partly crystallized tin ore cemented together by oxide of iron. (*Vide* Davies, *Metalliferous Minerals and Mining*, p. 186.)

The occurrence of spodumene with tin ore is novel, not having, so far as I am aware, been before observed. The association is not only unusual, but the magnitude of the masses of spodumene exceeds all record of this species. Crystalline masses extend across the face of the open cut from two feet to six feet in length, and from a few inches to twelve and eighteen inches in diameter. Blocks too large to lift have been freely tumbled over the dump with the waste of feldspar, quartz, and mica. No well-formed small crystals of convenient size to carry away could be found. The gigantic crystals preserve the cleavage characteristics and show the common prismatic planes. The color is lighter and is without the delicate creamy-pink hue of the specimens from Massachusetts. It is very hard, compact, and tough, and is difficult to break across the grain. Some of the fragments are translucent.

The muscovite mica, which occurs in large sheets, is entirely different from that in the greisen. It is like the ordinary commercial mica, but is rarely found in clear plates large enough to give plates over three by four inches in size. The inclination of the optic axes is from 67·30 degrees to 68 degrees.

In addition to this muscovite, there is a small amount of biotite; making three varieties of mica present in the mass. But neither the muscovite nor the biotite appears to be in direct association with the tin ore.

Other minerals, with obscure physical characters, are still under examination.

(TO BE CONTINUED.)

MILL FURNACE-BOTTOMS.

Experiments of interest to the iron trade have, according to English technical journals, been completed recently at the Greatbridge Iron and Steel-Works, Tipton, of the Greatbridge Iron and Steel Company, as to oxide bottoms for mill furnaces. An arrangement that has been adopted at several works in South Staffordshire, and also in Scotland, for doing away with sand bottoms and using oxides, is a hot-air chamber, patented by Mr. Job Tibbs. In constructing a furnace according to his invention, the iron plate bottom of the furnace is inclined from front to back, and also from the fire-bridge to the flue-bridge. At the back, and near the flue end of the furnace, is a hole or channel which opens out into a small supplementary chamber containing wagons, and during a heat the fused cinder formed runs off into the wagon, leaving the bed dry. An oxide bottom used under this arrangement, with a fettling of from 3½ inches to 7 inches thick, as compared with the sand bottom, will, the maker claims, produce a far superior quality of iron, and at a cost of at least 10s. per ton less, so effectual is the prevention of the accumulation of the melted cinder on the bed and its running in among the piles. The patentee claims also that whereas some cinder bottoms are used in plate and rail mills for the first heating, re-heating being accomplished on a sand bottom, by his chamber the second heating can be accomplished on the same bottom as the first. Recognizing its advantages, Mr. Scovil, of Scovil, who leases Coldbrook Rolling-Mills, St. John's County, N. B., Canada, is about to introduce this form of the oxide bottom system into the States, and for this purpose adapt the chamber to gas-furnaces in Pittsburg, where sand bottoms are now almost exclusively used. A native ore that would make as good a cinder bottom in the States as the pottery mine in Staffordshire was expected in the Port Henry ore, a high class hematite material, found in large quantities at Port Henry, on Lake Champlain, in the northeastern part of New York State. Five tons of this ore were sent over to Staffordshire, and it was to test its action that the Greatbridge experiments were conducted. There were present a number of South Staffordshire iron-masters during certain of the days during which the trial was proceeding. The five tons kept one mill furnace-bottom good, while 74½ tons of finished iron were made from it and rolled into angles and other sections. Throughout the trial, the heat was purposely kept extreme, in view of the prospective use of the gas-furnace, and the opinion was, that the greater the heat the better. On several occasions, the bottoms, during the heats and after them, were perfectly uniform in surface and in color, and, notwithstanding the extra heat, there were no cracks or gutters; while the clearness of the piles as they were taken to the rolls showed that there had been no approach to sucking. The appearance also of the sections after passing through the rolls was all that could be desired. Altogether, the Port Henry cinder was not only as good as that of the pottery mine, but surpassed it and led makers to remark that, if the ore could be got from the States at ballast rate, it would be worth while to import it rather than continue to use the pottery mine. Touching the action of the cinder in the puddling-furnace, it may be added that the cinder from the five tons was taken to two puddling-furnaces, and lasted eleven turns. The yield in this case also surpassed that obtained where the Staffordshire materials are used, being larger by 1½ cwt. per hour for the two furnaces. The cinder from the mill furnace turned out 28 tons 3 qrs. 26 lbs. of puddled bars, and the weight of pig-iron taken to the puddling-furnace was 29 tons 9 cwt. 2 qrs. 16 lbs., or 130 heats of 4 cwt. 29 qrs. 4 lbs. each.

THE TRANSVAAL GOLD LAW.

The following is an abstract, published by *Iron*, of the law passed by the Volksraad of the Transvaal to regulate gold mining in that country. The absence of a law giving encouragement to individual enterprise has been one of the reasons for the neglect of the known rich deposits of gold in the Transvaal, and now that the state has declared that its policy will be to welcome new settlers, many experienced gold miners from Australia and elsewhere will no doubt be encouraged to take out licenses. The law begins by giving the president power to proclaim as a "gold-field" any government property on which gold may be found. If gold in payable quantities is found on a private farm, the owner has the option of taking out, within six months, a concession for the exclusive right to work it. If he does not avail himself of this privilege, the government may buy up his property at a price to be fixed by arbitration. A commissioner is to be appointed for every gold-field, over which he will have authority to keep order, and to deal with all matters arising out of the workings of the mines. He will be assisted by a diggers' committee, to be elected by the license-holders and diggers, whose interests will thereby be fully protected. Every digger and license-holder will be liable to be called on to assist in maintaining order in case of necessity, under pain of forfeiture of the license or concession. The cost of a license to dig or prospect on government ground is fixed at 10s. per month; for prospecting on private ground, with the consent of the owner, the same fee is payable, three fourths of it to go to the owner. Only one claim can be taken out by a single individual, each claim to be 150 feet square, the limits of which must be duly "beaconed." Any person, however, may buy from other claim-holders any number of claims on taking out the proper license for each. The discovery of future gold-fields is encouraged by giving any prospector who discovers gold in payable quantities five per cent of the revenue which the government may receive from such field. This revenue will be derived from the sale of licenses, from a percentage of two and one quarter per cent on all finds, and from a percentage of four per cent on the purchase money on the sale of a claim. There is a curious provision that where the sum of £300 or more has been paid for a claim, or £500 or more for improvements in the erection of machinery, and is abandoned, it shall still remain the property of the owner for a period of six months after abandonment. This provision is intended to allow the owner to reap the advantage of any discoveries which may be made within that period of reefs on adjoining claims which might possibly prove to extend into his property. The least satisfactory part of the law is that which enacts that "any colored person who sells, barters, delivers over, receives, or has in his possesion rough gold shall be punished with lashes not exceeding fifty, and be imprisoned for the term of not exceeding twelve months." It is also enacted that no colored person shall have the right to hold a license or be in any way connected with the working of the gold-fields, except as laborers in service of the whites, who are prohibited, under a penalty of £500 or a year's hard labor, from paying the colored servant in rough gold, and from buying gold from any colored person under a penalty of £1000, or a year's imprisonment

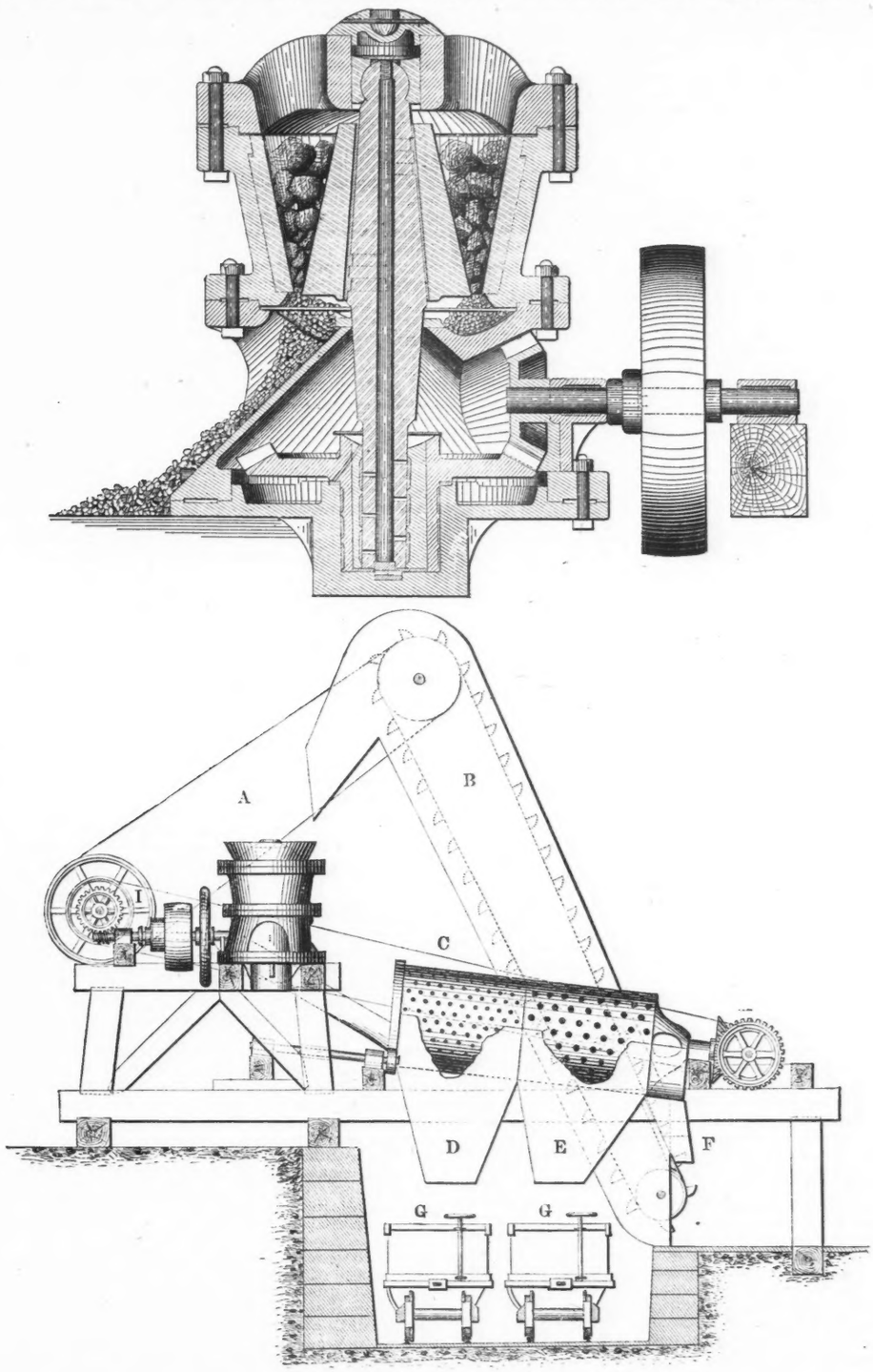
THE ELECTRICAL TRANSMISSION OF POWER.—M. Marcel Deprez has recently made a most successful application of his theories on the transmission of power at Grenoble, France. This city, being in a mountainous country, is surrounded by numerous streams, developing a power which, if utilized, might be a source of great wealth. The municipality of Grenoble invited M. Marcel Deprez to repeat the experiments which he had performed with success at Munich and at the Gare du Nord at Paris. The power was supplied by the stream of the Romanche (14 kilometers from Grenoble), and thence conveyed along a copper wire of two millimeters in diameter. The mechanical effect was about 60 per cent, and the utilized power seven horse. A part of this pumped some water employed to produce an artificial cascade. The remainder M. Deprez divided between all the machines of a small work-shop, and lit besides 300 Edison lamps.

BALANCING THE WEIGHT OF THE HOISTING-ROPE IN SLOPES AND INCLINED PLANES.—Prof. J. von Hauer has called attention to a point which probably has escaped the attention of the majority of mining engineers. In a slope or inclined plane, the lower portion of which is not as steep as the upper part, the weight of the hoisting-rope is balanced. During hoisting, the relative weight of the ascending platform or car goes on increasing, while the actual weight of the rope suspended of course decreases; the reverse being the case with the descending car. By correctly choosing the curve of the incline, the weight of the rope may be balanced. Professor Hauer quotes the following example: The weight of the load was 600 kilograms, that of the empty car and platform 750 kilograms, the weight of the rope 1 kilogram per running meter, and the vertical distance between upper and lower landing 150 meters, the average dip being 32 degrees. Calculating the cycloid curve, the inclination at the upper end was found 36 degrees 17, and at the lower end 27 degrees 16 minutes, the greatest distance between the curve and the straight connecting line being 5·9 meters, and the total length of the incline 283·48 meters. The constant load thus obtained was 317·5 kilograms, against variations between the extremes of 468 and 168 kilograms with an incline of uniform pitch. In many cases, it will be cheaper to build such an incline by following the dip of a seam or the contour of the surface than to cut into the hanging-wall, or sink at a uniform incline in the case of surface planes.

THE COMET CRUSHER.

Crushers of the well-known Blake type, having a reciprocating action, do work only during a part of the time. The idea of so changing the design that work is continuous, naturally suggested itself, and it is to this class of machines that the Comet crusher belongs, the construction of which is shown in the accompanying engraving. In the jaw-crushers, the rock is broken by the approach of two plane surfaces; in the Comet crusher, the planes are converted into circular surfaces, the reciprocating being changed to the rotary motion of the inner crushing surface, which is mounted eccentrically on the shaft. The distance between a given point of the fixed outer surface and the rotating inner surface varies therefore during every revolution between the maximum and the minimum. During one revolution, therefore, the rock between the two surfaces is once subjected to crushing action, which is thus continuous.

Our section through the center of the Comet crusher clearly shows its construction. Power is applied by belt, and by gearing is transmitted to the upright shaft. The lower end of the latter enters the eccentric sleeve shown; and by changing the portable eccentric sleeve, the throw of the head may be varied to suit the exigencies of each case as to the size to which the material is to be crushed. The eccentric hub is so arranged that double wear may be got out of the gear hub. The upright shaft is made of steel, and being hollow, acts as a reservoir for the oil used for lubricating the step. Messrs. Fraser & Chalmers, of Chicago, who are the builders of the Comet crusher, attach the breaking-head to the upright shaft by means of bolts, avoiding the use of zinc. The outer circular surface is made of plates set with zinc, one of them, however, having a reverse taper, so that it can be quickly removed, and the others be got at. The ore is fed in at the top, and drops out through three discharge-openings so designed that clogging is not possible, while at the same time the gearing is protected. The frame is made in sections, so that while, strong, it can be readily transported.



THE COMET CRUSHER.

The crusher, of which five sizes are made, has an excellent record for crushing material for railroad and street ballast, for which it is principally used. It possesses one feature, which, we presume, should make it of particular value for concentration-works—that of breaking the rock into cubical form; and, as it does not grind but cracks the material, of avoiding undue breakage.

In our second drawing, we show a design for an entire plant, the points of which will be readily understood.

THE MINING AND METALLURGY OF ZINC IN THE UNITED STATES.*

By F. L. Clerc.

The Present Status of Zinc Mining and Metallurgy.—Even the most superficial inquiry into the condition of the zinc industries of the United States can not fail to expose the barrenness of the literature pertaining to the subject, and the entire absence of reliable statistics by which any comparison may be made with the state of these industries in other countries. A compilation of nominal market quotations shows little more than sudden fluctuations in the price of the various zinc products, which neither the custom-house returns nor the ruling price of foreign products will satisfactorily explain. A more careful examination into the methods of manufacture at the different works, and inquiry into the general results obtained, are apt to leave the impression that the whole subject is enveloped in mystery, belonging more properly to a secret art in the middle ages than to a growing industry of the present century. Every year or two, some European expert makes a rapid tour through the country, and announces that our ores are "equal to the best in Europe, but that our methods of mining and preparing them are extremely wasteful, and our methods of smelting are crude and extravagant, and fully a generation behind European practice in technical value and economy." It can not be denied that there is much justice in these criticisms; nor is a comparison any more favorable to this country, if we regard only the magnitude of our output or the cheapness of our products.

This inferiority can not be excused on the ground that the art of mining or that of zinc smelting is still in its infancy in this country; but it may be explained in part, first, by certain general limitations to improvement imposed by the nature of the operations necessarily involved in the smelting of zinc; and secondly, by the peculiar condition of our ore supply. In its essential features, the metallurgy of zinc is the same all over the world. The metal must be distilled in fire-clay vessels, in the presence of carbon, and condensed out of the reach of oxidizing agents. The dimensions of the distilling vessels are restricted within very narrow limits, by the nature of refractory materials and the thickness of the charge through which the necessary heat to effect reduction can be economically transmitted, and but little improvement is to be hoped for by a change in these dimensions. The operations to which the ore and products must be submitted are numerous, and the repeated handling of them can not be avoided. The recent improvements in European practice have not been the results of changes in the form of the furnaces, or in the methods of treating the ore, but have resulted from careful economies in the use of labor, fuel, and ore, and have only kept pace with the concentration of mining and smelting industries in the hands of strong companies, and are in general such as can only be introduced by companies with abundant capital, and where operations of a certain magnitude are carried on. Moreover, the policy of these companies has been, by regulating the output of the mines and the disposition of the metal, to give a steadiness to the value of both the metal and the ores, which has rendered comparatively safe such investments of capital as would otherwise have been precarious.

Such a condition of affairs can only be gradually brought about in this country, owing largely to the circumstances under which existing works were established, and to the peculiarities of the ore supply. The conditions under which smelting is carried on at the different works in this country are so various that only a general description of them is practicable; and the question of ore supply is so important that it merits more than a passing notice. The greater part of the ore used in this country is obtained as a more or less valuable by-product in the mining of lead ore; and its selling price is not controlled, either by the value of the metal it contains or by the cost of its discovery and mining. Hence its value is subject to sudden changes, and the investment of capital in zinc mining is rendered more or less unsafe. This fact has exerted a controlling influence on the methods of mining and selling the ore, on the districts most extensively worked, on the location of the principal smelting-works, and on their policy toward the ore-producers, and its effects will probably long continue to be felt on the zinc industries of the country. Its full importance may perhaps be obscured by the fact that lead and zinc ores are almost universally found associated together; but where the selling price of both ores is controlled by the value of the metal they contain, each bears its proper proportion of the cost of mining, and neither unduly depreciates the value of the other. The inland location of existing mines and works in this country, as compared with the mines and works of Europe, makes them more dependent on railroad transportation and less easily adaptable to changes in the mining and smelting centers. The metallurgy of lead is so simple that, when rich deposits of lead and zinc ore are discovered, the lead ores are quickly made available by furnaces erected to treat them, and are mined extensively; while large amounts of zinc ore are often neglected or thrown aside as worthless. The metallurgy of zinc is so complicated and expensive that it is slow to adapt itself to new localities, and the works within reach of the new ore-fields have a practical monopoly of these markets.

Sources of Supply.—The present sources of ore supply may be grouped under three divisions: the Eastern, including New Jersey, Pennsylvania, and Virginia; the Middle, including Wisconsin, Illinois, and Tennessee; and the Western, including Missouri and Kansas. These divisions correspond very nearly with distinct types of furnaces and different systems of mining, and may conveniently be treated of separately.

EASTERN DIVISION.

New Jersey.—In the Eastern division, the most notable deposit of zinc ore is in Sussex County, New Jersey, where, near the town of Franklin, there is found an absolutely unique deposit of the three rare minerals zincite (red oxide of zinc), willemite (anhydrous silicate of zinc), and franklinite, forming a rock-like mass, not unlike in appearance an eruption of granite, in which the franklinite represents the quartz, the willemite the feldspar, and the zincite the mica. This mass fills the space between limestone walls, and is crossed by numerous "trap" dikes, ranging from a fraction of an inch in thickness up to twenty feet; and is interspersed with occasional bunches of calcite, fowlerite, and other crystalline minerals. The principal mine is on Mine Hill. The ore is reached by a tunnel about 75 feet below the outcrop, and has a width of from 40 to 50 feet. It appears to be a chimney-like deposit, of the form so common in magnetite mines; no limit to it has yet been found in depth or in horizontal extension. This deposit, which has been the subject of numerous long and expensive litigations, is now controlled and worked by the New Jersey Zinc and Iron Company, with a capital of $3,000,000, which in 1880 consolidated rival claims. The ore is easily mined, and requires little selection. The cost of mining and putting it on cars should not exceed the cost of quarrying an equal amount of limestone.

An average sample would contain about 36 per cent oxide of zinc, 22 per cent metallic iron, and 11 per cent metallic manganese. Owing to its low percentage of zinc and high percentage of iron and manganese, this ore is unsuitable for the manufacture of spelter. The mechanical separation of the zinc ores has been found impracticable, on account of the intimate chemical and mechanical mixture of the different ingredients. The ore is, however, particularly adapted for the manufacture of oxide of zinc, or "zinc-white," for which purpose it is exclusively used. The works of this company are at Newark, N. J., at which point it has excellent facilities for obtaining a cheap supply of pea and slack anthracite coal, and direct communication with the mine by canal and railroad.

A smaller vein on Mine Hill, called the "front vein," has been proved for several hundred yards: it varies from 8 to 20 feet in width, and is occasionally pinched out by the wall rocks; it carries a less proportion of zincite and a greater proportion of calcite than the large vein, but its ores are of a similar character. Part of this vein is owned by the above-named company, and part is at present furnishing ore to the Lehigh Zinc-Works, at Bethlehem, Pennsylvania.

Similar veins are found at Sterling Hill, about two and a half miles distant, and have been worked to a depth of about 200 feet by the New Jersey Zinc Company, now incorporated with the New Jersey Zinc and Iron Company, and by the Passaic Zinc Company. On the property of the latter company, they are accompanied by irregular beds of beautifully crystallized calamine, from which, as it is almost entirely free from lead, a high grade of spelter is made at the works of the company at Jersey City. Mining at this point has been almost entirely suspended during the last few years, as the Passaic Company has had a contract for ore from the large vein on Mine Hill.

The shipments of zinc ore from this county for the year 1882 are reported by the State geologist to have been 40,138 tons; and the total output up to the present time may safely be stated at upward of 250,000 gross tons.

Pennsylvania.—The zinc deposits in the Saucon Valley, Lehigh County, Pennsylvania, which were once extensively worked, now produce but little ore. Their history, however, has a special interest from their connection with the introduction of spelter-making into this country, and from the fact that they belong to a class of deposits which seems to warrant a belief in their continuance to a considerable depth, and because they are a good illustration of the general effect of the characteristic feature of the ore market above referred to. Three principal deposits have been discovered, known respectively as the Ueberoth, Hartman, and Saucon mines: they occur in magnesian limestone of the Lower Silurian formation, and have many points in common, while they also present some striking differences. They were all at one time owned or controlled by the Lehigh Zinc Company, whose works were at Bethlehem, four miles distant. The Ueberoth mine, which is, so far as developments have shown, the largest, was worked continuously from 1853 up to the fall of 1876. It was for many years the main dependence of these works, and produced in the neighborhood of 300,000 tons of ore. The strata of limestone are here very much disturbed and tilted up almost to the vertical, apparently by the obtrusion of the syenite ridge of the neighboring South Mountain. The ore came close to the surface, and a very rich pocket was found in the clay above and around limestone boulders, which is estimated to have produced 100,000 tons of ore. When this body of ore was exhausted, the ore was followed down in crevices between the boulders. These crevices lie in planes parallel to the bedding of the limestone, or in planes perpendicular to it, and preserve great regularity in their position, and a parallel course for several hundred yards in a northeast and southwest direction: they are nearly vertical, and at the depth of 225 feet, to which the mine was worked, showed no signs of closing up. The ores at first were exclusively calamine and smithsonite, but at greater depth blende made its appearance, coating the walls of the crevices, and in some cases penetrating into them several feet; in other cases, segregated as rich seams, which nearly filled the cross-openings. At first, it was confined to the northeastern end of the mine, but at the lowest depth reached it could be traced almost continuously to the extreme southwestern end. The dip of the ore-body appeared to be regular, and to the southwest. Six of these parallel crevices were worked, and about as many crossings; and where they intersected, rich bunches of ore were found, some of which were as much as 60 feet across and 20 feet thick. All the indications seemed to point with increasing certainty to the existence of a backbone or underlying deposit of blende, out of the reach of the action of meteoric waters, from the continuation of which the oxidized ores have been derived. Timbering the mine was always a serious difficulty, but the greatest obstacle to be overcome was the water. Even at a depth of 40 feet, the flow was already very strong; at the depth of 150 feet, it was found necessary to put in what was then the largest pumping-engine in the world. This engine, which is a single cylinder, double-acting, condensing, walking-beam engine, with a pair of fly-wheels, has a 110-inch cylinder and a 10-foot stroke, and is calculated to work four 30-inch plunger-pumps and four 30-inch lift-pumps, with 10-foot stroke, and to take water from a depth of 30 feet. At the time it was stopped, it was running from six to seven strokes a minute, and was working three pairs of 30-inch pumps and one pair of 22-inch pumps, and was easily handling all the water that came to them. The pump-shaft and foundation for the engine were no less remarkable in their way. The latter was built up from the solid rock, 60 feet below the surface of the ground, of hewn blocks of Potsdam sandstone; the former, which measured 30 feet by 20 feet in the clear, was started on a small crevice, and timbered with 12-inch square yellow pine sticks, and divided into three compartments, and further strengthened by two open brattices of the same heavy tim-

* From advance-sheets of *The Mineral Resources of the United States*, published by the United States Geological Survey, Department of Industrial Statistics. Albert Williams, Jr., Chief of Department.

ber. When the pitch of the vein carried it out of the shaft, the rest of the depth was sunk through solid rock.

The Hartman mine, distant about half a mile, was worked at first exclusively for calamine. Its exploitation gradually exposed a central horse of blende, which the method of mining adopted made it necessary to leave for the support of the timbers which carried the roof. The increasing importance of this blende at the lowest level worked, 150 feet, caused a change to be made in the method of mining. The mine was operated for a year after the large engine was stopped, and the last work that was done was the putting in of a slope to develop this deposit of blende. The water in the Hartman was always less strong, the pitch of the crevices less steep, and the surrounding rock less disturbed than in the Ueberoth mine; the strike of the crevices was more to the west, and the blende came nearer to the surface.

The Saucon mine, however, affords the simplest and best illustration of this form of deposit. It is distant about a quarter of a mile, and was originally leased by the Passaic Zinc Company, by whom it was sub-let to the Lehigh Zinc Company on high royalties. When the rich deposit of calamine first discovered was apparently exhausted, this sub-lease was surrendered by the latter company, and in 1875 the original lease passed to the Bergen Point Zinc Company, by whom the mine has been worked ever since. A face of blende was uncovered at the western extremity of the open pit, and the ore followed under a heavy cap of limestone for a distance of 250 feet up to the property of the Lehigh Zinc Company on the west. On this property, it was reached at a depth of 110 feet, under 100 feet of solid limestone, and was followed 150 feet farther on the course of its strike. On both properties, it was followed to a depth of nearly 200 feet. In the fall of 1879, all the property of the Lehigh Zinc Company passed into the hands of its bondholders under foreclosure of its mortgages, and in the spring of 1880 all the mining property was sold to the proprietors of the Bergen Point Zinc-Works.

The workings of these two mines, taken together, show a remarkable regularity of width, pitch, and course, and the deposit is clearly shown to be a large chimney or chute of ore of irregular cross-section, which, however, preserves a lenticular shape, the longer axis of which is about 60 feet, and pitches to the south at an angle of about 30 degrees: the transverse axis measures about 30 feet. The axis of the ore-body dips to the west-southwest with a slope of about one foot in four. The weathered outcrop has evidently given rise to the pit of oxidized ores and to certain irregular detached deposits which lie in the same course, several hundred yards beyond it.

Here, then, are three similar deposits of zinc ore, with their nearly parallel chimneys of blende and their corresponding beds of calamine, which have evidently been brought up from below, by solution in thermal springs, through crevices formed in the limestone by the gradual upheaval of the neighboring South Mountain, and have undergone subsequent alteration from the action of meteoric waters. Nearest the mountain, where the strata are most tilted and the ground most disturbed, the water is strongest and the largest deposit of calamine is found. In the Hartman mine, the strata are more nearly flat, the blende is sooner met with, and the water is much less strong; and in the Saucon mine, the blende is met with at the edge of the pit, and only moderate-sized pumps are required in working it at a depth of 200 feet. That the water in these mines comes from the same surface springs which supply the Saucon Creek, is evident from the fact that, when the big mine was abandoned, this creek shrank at once to a small fraction of its former volume, and only gradually recovered it as the mine filled up. Very careful surveys of the bed of this stream failed to discover any point at which it showed any diminution of its volume or seemed to sink into the ground. It is, therefore, very improbable that the water, having once come to the surface, found its way back into the mine. It was probably tapped in underground courses connected with the springs which give rise to the creek. This is the more probable, as the mine which has the most water is on the highest ground and is farthest from the creek, and the mine having the least water is nearest the creek. It is therefore reasonable to suppose that nearly the maximum quantity of water likely to be encountered was already handled, and that, if a solid body of underlying blende were developed, it could be profitably worked with the machinery already in place. The Saucon mine is still the main dependence of the Bergen Point Zinc-Works, but its continued working must be attended with increasing cost and uncertain risks.

The ores of this region are remarkably free from lead, arsenic, and antimony, and it is this circumstance that gives them their principal value and interest, and has been the basis of the very high reputation of the metal and oxide obtained from them. Only the richest of the ores are, in the present state of the ore market, available as spelter ores, but even the leanest of the oxidized ores produce a very fine quality of oxide. The blende is very peculiar. It is massive, and rarely shows even traces of crystallization; when pure, it has a bluish slate color, has a very characteristic conchoidal fracture, is translucent on thin edges, and gives a clear ring when struck. As generally sent to the works, it resembles broken limestone; is somewhat mixed with iron pyrites, and assays from 35 to 40 per cent of zinc. It is not easy to concentrate, both on account of its non-crystalline structure and of the pyrite it contains.

The causes which led to the extinction of the Lehigh Zinc Company and the abandonment of the two first-named mines were briefly these: the impossibility of competing successfully in the oxide market with the owners of the big mine in Sussex County, New Jersey, after the expiration of the patents covering the oxide process left them free to take the trade, or in the sheet-zinc and metal market with the Western smelters, using cheaper and richer ores, at a time when a general depression of all manufacturing enterprises made it unusually burdensome to carry the heavy bonded indebtedness incurred during a period of high prices and general inflation in acquiring mines and putting up machinery to work them. Under more favorable circumstances, it is probable that these mines could have been profitably worked for years to come; for although the pumping expenses were heavy, they were not excessive, considered as a royalty on the ore, and these charges per ton would diminish in proportion to the amount of ore mined. Now, however, it will probably be left for another generation to discover what value they still have.

Other deposits of zinc ore have been discovered in the same Silurian formation in Pennsylvania, Maryland, and Virginia, which have been worked from time to time, but have produced very inconsiderable amounts of ore. Small oxide-works were built at an early day near Birmingham, Blair County, and at Landis station, in Lancaster County, Pennsylvania, but they were soon abandoned. At the latter point, shallow beds of rich carbonate of zinc were first discovered, but were worked out. About 1876, expensive concentrating-works and two blocks of spelter-furnaces were put up, to treat the grains and kernels of crystallized blende scattered through the underlying limestone, before sufficient exploration was made to warrant such an outlay of money: they have for years been lying idle.

Virginia.—In Wythe County, along the New River Valley, zinc ore is scattered over the surface of the ground, and in connection with lead ores several thousand tons have been mined and sold to various Eastern smelters to be made into oxide. One deposit is at present worked by the Bertha Zinc Company, which has erected concentrating-works and furnaces at Martin's station, and finds a market for the limited amount of spelter which it produces, at prices above the market for Western spelter, because of its freedom from lead.

MIDDLE DISTRICT.

Illinois and Wisconsin.—With the establishment of zinc-works at La Salle, Illinois, began a revolution in the zinc trade, and Eastern smelters were soon to be restricted to the limited market for special brands of spelter. The lead regions around Galena, Dubuque, and Mineral Point had long been known and extensively worked, and large quantities of zinc ore had been discovered in prospecting; thousands of tons had been mined and stowed away in abandoned drifts, or hoisted to the surface and thrown on to the dumps, or scattered around the wash-places as worthless "jacks;" for years, ore was to be had for very little more than the cost of loading and hauling it to the smelters, and in these years were laid the foundations and established the business of those companies which dominate, if they do not control, the zinc industries of the United States. Gradually, as the ore already mined became exhausted, and other companies, attracted by the large profits there seemed to be in the business of smelting, were induced to embark in it, and as the richest deposits of lead ore were worked out and the lower price of that metal caused a falling off in lead mining, zinc ore rose in price and began to be mined for its own sake, and the condition of affairs now existing was brought about. Southern Wisconsin and the Galena District are still important zinc-producing centers, but far larger amounts of ore are now drawn from the still richer lead regions farther West. The best authorities estimate the total output of the lead region of Wisconsin prior to 1876 at 115,000 gross tons, the largest amount shipped in any one year being 19,621 tons in 1872. The output in 1880 is estimated to have been about 15,000 tons. In comparing these figures with the output of Eastern mines, it should be borne in mind that they represent a considerably larger amount of metal than their amounts would indicate, as only the richer ores are sent to the smelting-works, and the poorer are scattered about the mines. With a few exceptions (as in the case of the Illinois Zinc Company, which bought out and consolidated the different interests in an important mine in the Galena District, and by systematic working and better equipment has made it an important feeder to the works), all the mining is done by small companies, mostly unchartered associations of persons living in the immediate neighborhood. The royalties paid to the land-owners vary from one tenth to one quarter of the ore raised. Some storekeeper, farmer, or local capitalist furnishes the small amount of money needed for tools; and the men who work in the ground in winter usually engage in farm-work during the summer. The ore is generally raised to the surface by a windlass, and cleaned by hand with a "pickawee" hammer, or crushed with a "bucking-iron" on a flat stone, or by an itinerant horse power crusher, and is concentrated by sluicing and hand-jigging, and is then exposed for sale. The smelting companies which draw their ore supply from this district have their resident or traveling agents, who examine the ore as it is raised, and either contract for the output of the "diggings," or buy the ore in the ricks. Most of the miners are poor and unable to work their diggings to good advantage, or to hold their ore long after it is cleaned. The output from any given locality is small, but the aggregate is very considerable. The ore raised in this region varies greatly in quality. What has been said above refers particularly to the shallower deposits, or the old abandoned lead workings where water is not troublesome. There are shallow deposits of "dry bone" (carbonate of zinc) which are extensively worked in this way, some portions of which are very rich; but these rich layers have ordinarily a thickness of only a few inches. Above and below them, are heavier layers largely contaminated with limestone, too lean to be sold as spelter ores, which can not be concentrated. The mining for the rich ores alone is seldom very profitable, and large amounts of the lean ores are still scattered through the mines above and below ground. If a reasonable market could be found for this, many mines could be worked which are now abandoned. In 1879–80, three or four thousand tons were shipped by the Lehigh Zinc Company to Bethlehem and made into oxide. When proper care was taken to keep out any material that would discolor the oxide, a very fair quality of paint was made, and a yield of from 30 to 33 per cent was obtained. Within the year, oxide-works have been erected at Mineral Point, to run on this material.

This district, which is called the Upper Mississippi lead region, has been known to contain lead since the beginning of this century, and lead mining has been extensively carried on for upward of fifty years, and has in some cases proved very profitable. The lead occurs in the Trenton and Galena limestones of the Lower Silurian formation, which preserve their horizontal position. It is found in vertical and horizontal crevices, of which in Wisconsin alone more than 2232 have been surveyed by Mr. James Wilson, Jr.; of these, 1325 were east and west, and 482 north and south, the remainder being irregular in strike. These crevices are associated under more than forty different groups, and most of them contain some zinc ore. The east and west openings are found to be most productive, and the lowest contain the greatest proportion of blende. Where the blende is associated with galena, it is capable of being brought up to a high percentage at the mines; but where the two ores are intimately mixed and free from gangue, they are generally bought by the smelters as mined, and separated in the dressing-works at the furnace. There is also a silicate of zinc, much mixed with galena, which is treated at the mines to a rough calcination with wood in piles,

after which it is crushed and the galena is washed out. Any thing like an accurate description of this region is out of the question. Diggings are opened, change owners, are shut down, cave in, are reopened, and abandoned: little record of the yield of particular ground is kept. The skilled miners who work here are of a roving disposition; each one who wanders away carries his secrets with him; all over the country may be seen abandoned workings of which no one knows any thing beyond vague report.

Tennessee.—In Tennessee, near Knoxville and elsewhere, deposits of zinc ore have for many years been intermittently worked, and considerable amounts of ore have been calcined and shipped to Eastern smelters (and it is now proposed to build works nearer the mines); but they may be passed over, for the reason that they have had very little effect on the metal output of the country, and for the same reason the more important deposits along the line of the St. Louis & Iron Mountain Railroad, which for many years were the principal source of supply of the Carondelet smelters, will only be alluded to.

WESTERN DIVISION.

The Lead and Zinc Region of Southwest Missouri.—The lead and zinc region of Southwest Missouri is known to embrace the greater portion of Green, Dade, Lawrence, Jasper, Newton, and McDonald counties, and to it adjoins the mineral region of the eastern part of Cherokee County, Kansas. Throughout the whole of this region, both lead and zinc have been found; but the most productive district, and the only one at present worked, is confined to the northern half of Newton County, the southern half of Jasper County, and the eastern end of Cherokee County, Kansas, and to the area drained by the three streams, Center Creek, Turkey Creek, and Shoal Creek, which flow west and north and empty into Spring River within six miles of each other. In this region, the towns of Granby, on the south, and Joplin, on the north, are the centers of the principal mining activity. A very careful and intelligent account of this region, so far as it had then been developed, is to be found in the report of Dr. Adolf Schmidt and Mr. Alexander Leonhard, published in the Geological Report of the State of Missouri for the year 1873–74, to which the reader is referred. Work on the survey was interrupted in 1876, and has not since been resumed, for which reason few reliable statistics have since been published. The importance of this region as a source of zinc ore dates from the year 1871. In this year, the first regular shipments of ore were made from Granby to the zinc-furnaces at Carondelet. The discoveries of rich deposits of lead ore at Joplin in the same year, and their wonderfully rapid development, had also an immediate effect on the prosperity of this region. Here, as in Wisconsin, the discovery of zinc ore is proportional to the activity in prospecting for lead ore. The production of zinc ore for the year 1874 is given as 19,000 tons, and the present output is variously estimated at from 1000 to 1500 tons a week. There is no doubt that the latter figure is often reached, and could be maintained from present developments, except when mining is extensively interrupted either by wet weather or excessively low prices for lead or zinc ore; or that more than two thirds of the spelter made in this country comes from ore mined in this region. The ore is found in the sub-Carboniferous formation, and there is an evident connection between the known deposits of ore and the present system of surface drainage. Dr. Schmidt observed, as a remarkable fact, that the largest deposits do not lie along the principal streams, but at the heads of the smaller tributaries. The deposits of Webb City, Carterville, Empire, Galena, Sherwood, Belleville, and Blende, discovered since his examination, and now the principal sources of zinc ore, fall under the same rule. These throw new light upon the character of the mineral formations, and seem to warrant increased confidence in their extent and depth. The most important zinc mines of this region are those at Carterville and Webb City, which are really parts of the same deposit. They produce more than half of the zinc ore raised, and are worked principally for zinc ore.

As these deposits are very regular in their formation, and in a measure rule the ore market, and as the method of mining them is essentially the same as prevails throughout their entire district, a general description of them and the method of mining them will here be given. These mines lie in the open prairie, which was once cultivated in farms, about five miles northeast of Joplin, near the head of a small branch of Center Creek. They were discovered about the year 1877. Here, at a depth of from 40 to 100 feet, and often under a cap of limestone and flint 60 feet in thickness, has been found an immense deposit of zinc-blende, which has been worked continuously for over half a mile. The deposit is in the form of a bed of flint, traversed in various directions by solid bars of barren flint, but in general resembling a breccia of sharp, angular pieces of flint, closely cemented by crystallized blende, with occasional masses of bright, crystallized galena. With the exception of these bars and occasional pillars to support the roof, the whole body is blasted out. Draining is difficult, and rock drifts are sometimes necessary to unwater the ore. Dr. Schmidt considers a secondarily deposited quartzite to be the cementing material between the chert and the zinc-blende in the very similar deposits found at Oronogo; but this is certainly not the case in the best mines at Webb City nor at Sherwood, and zinc-buyers soon learn to detect the difference. Where the cementing material is pure blende, the blende breaks freely from the chert, and can be almost entirely cleaned by crushing and jigging; where the cementing material is quartzite, or black sand as the miners call it, crushing is difficult, and a satisfactory separation is impossible. The mines spread over about a section of land, 640 acres. Their weekly output is about 700 tons. The method of working them is as follows: When a good prospect is discovered in new ground, the land around it is leased from its original owners, on royalties ranging from 10 to 25 per cent, by a number of individuals, who organize various mining, or as they would more properly be called, land companies. These companies have the land divided up into lots 200 feet square, and a plat of it made; select certain lots for themselves, and throw the others open to miners. They usually start a shaft on one of their own lots, and put in a pump. If the indications continue good, many of the lots, particularly those near the pump-shaft, are quickly taken up by parties of miners, who sink shafts upon them, timber the ground, put up hoisting contrivances, furnish all supplies, and bear all expenses.

When ore is struck, it is drifted on and followed in all directions up to the boundaries of the lot in question. The ore is raised to the surface and crushed and washed by the miners, and is sold to one of the zinc or mineral buyers. It is weighed over the company's scales, and paid for to the company, which deducts a royalty of 25 per cent on zinc-blende and 50 per cent on "mineral" (galena); and if it has pumps running, a pump rent of $1 a ton on zinc ore and $2 on 1000 pounds of galena; and pays over the balance to the miners. The royalties, of course, vary with circumstances, but the above are general. The holders of lots hire other labor to do the mining, at from $1 to $1.50 a day; and usually put up crushing and washing machinery on their lots. Very often the same parties control two or three adjoining lots or fractions of lots, and sometimes neighbors go into partnership. Most companies do not allow ores to be taken from the lots on which they are mined until they have been cleaned and have paid royalty. The machinery is usually of the simplest description—a farm or small stationary engine, covered by a shed of rough boards, a small-sized Blake's breaker, set over a pair of rolls, and a horse whim or a whip. The jigs are ordinary hand-jigs, with an overheard breakstaff, working a sieve 2 by 3½ feet up and down in a box of water. The jigging is usually done by contract, and is paid for by the ton of cleaned ore. It is common to see from 10 to 20 of these jigs grouped together under a shed of poles, covered with branches of trees or rough boards. The ore as crushed yields from 10 to 50 per cent of cleaned ore, and the No. 1 grade assays about 60 to 62 per cent of metallic zinc. The tailings must in most cases be piled up on the lot from which they have come; they are drawn up into a mound with two-horse scrapers or belt elevators, and it is not an unusual sight to see jigs and crushing machinery perched on top of these mounds 15 or 20 feet above the surface level, the shafts being timbered up to a corresponding hight. Several land companies have put in fairly effective pumping machinery. Plunger-pumps working in pairs, with wooden walking-beams or bob-cranks, and driven by gearing and a crank-shaft, are the most common; but direct-acting steam-pumps, like the Worthington or Blake, have been largely introduced of late, notwithstanding the disadvantages they labor under from the gritty water of the mines. From a distance, these mines, with their swarms of busy men and heaps of tailings piled around the shafts, remind one strongly of gigantic ant-hills, and present a sight not soon to be forgotten. No one can fail to be struck with the glaring defects of such a method of mining, the absence of system, the useless duplication of machinery, the cheap yet expensive expedients, and the crowding together of conflicting operations. Below ground, the effects are, if possible, worse. Each lot is affected by the policy of its neighbors; pillars are left only when they are thought to be absolutely necessary; each miner tries to get as much as possible out of his own lot, is only interested in it as long as he expects to work it, and is not disposed to improve the value of adjoining lots by unwatering them or proving their ore. The roof and pillars are badly trimmed, and in many cases dangerous, fatal accidents being distressingly common. The officers of the land companies are generally individually interested in one or more lots, and all sorts of questions are continually arising from the conflicting interests of the company and the miners.

Looked at altogether, as the main dependence of the zinc industries of this country, such a condition of affairs is far from satisfactory, and yet it is not easy to suggest a practicable remedy. If a single company with sufficient capital could control all the lots and work them in connection with each other, the output could be largely increased, the cost of mining and dressing the ore greatly reduced, and the value of the mines kept up for a longer period, and the ore could be sold to better advantage than can be hoped for under the existing method. But this is seldom possible after the present system is once in operation; too many individuals have acquired rights in the mines, which they value at what they hope to get out of them. Nor is the present arrangement without obvious advantages in a new country, and it is seriously questioned whether any other could be as effective or as economical. When mineral is once discovered, it requires but little capital to open mines, and consequently the individual risks are small. The miners, working on their own account, with hopes of large ultimate gains, have every inducement to work hard and cheaply, and to follow every clew that may lead to the discovery of ore. There is a large body of keen, hard-working prospectors, who during the season wander from place to place, live in wagons, under tents, or in the open air, and carefully observe and follow every real or supposed indication of ore. How else, it may be asked, could prospecting be so well or so cheaply done? And there is a class of enterprising, skillful, well-to-do miners, naturally associated as partners, who have made one or more good strikes, and are always ready to take hold of any new venture that promises well, either in working a lot or in forming a land company to open new mines. Where else could be found capitalists so willing to risk their money in a speculative venture? Men of this sort are always ready and able to work themselves, or to direct the work above or below ground. How else could be obtained as willing and as watchful superintendents, foremen, and clerks? New towns are started every year, and the mining district is rapidly extending. No uniform development seems to lead to this extension; chance and the policy of the land-owners appear to be the only determining causes.

The towns of Galena and Empire, on Short Creek, in Kansas, were brought into sudden prominence in 1878, and restored the waning fortunes of the Joplin region, by the exertions of two land companies, which, on the strength of two or three rich but undeveloped prospects, laid out two rival towns, and sold town-lots without reserving mineral rights; and by extensive advertising throughout Missouri and neighboring States, created an excitement which had a purely speculative basis, but led to the collection of a large number of miners and a considerable aggregate of money. Fortunately, the results very nearly justified their most sanguine representations. The land companies then withdrew all of their remaining lots from the market, and the success of the mines was secured. They are now the principal mines for lead ore in the region, and their output of zinc is increasing.

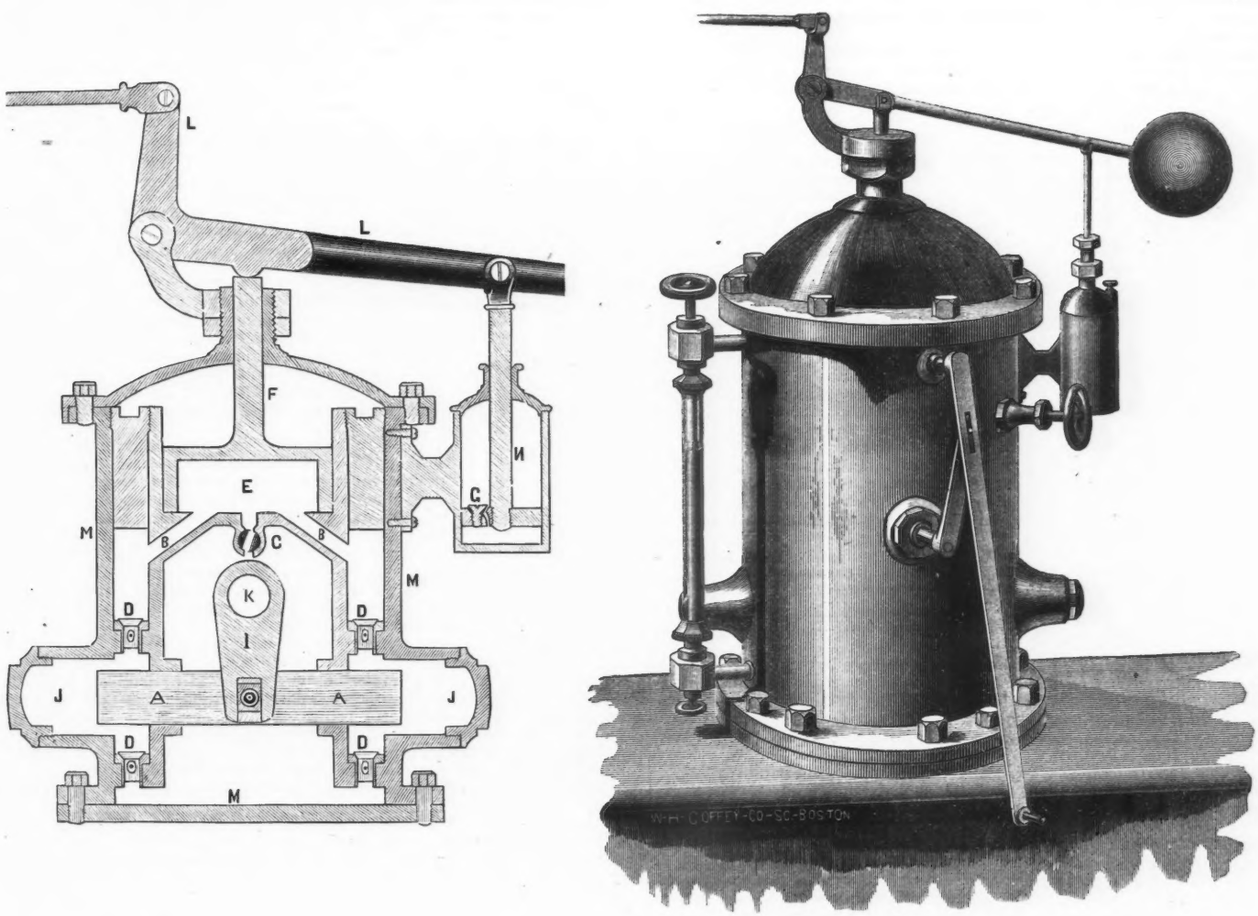
For the discovery and working of shallow deposits, the present system seems the best that can be devised; but it is clearly not adapted to solve the problems of discovering deeper deposits or working them to advantage. No system can be defended which involves extravagant expense in mining and preparing the ore for market, forces the sale of it without

regard to its value, and renders worthless large bodies of ore that might be profitably worked by a better system; and no basis for a great industry, like the zinc industry, which makes it depend on a hundred chances independent of the price of metal, the cost of smelting, or the known deposits of ore, can be considered very safe to build upon. The caving in of a single mine, the breaking down of a pump, less activity in lead mining, or the scattering of the miners to richer camps may cause a falling off in the output of ore from which it would be very difficult to recover. That mining has on the whole been very profitable in this region, is established from the fact that the country around has steadily and rapidly increased in wealth and population. Within the last few years, three railroads, the St. Louis & San Francisco, the Missouri Pacific, and the Kansas City, Fort Scott & Gulf, have built branches through the ore-fields to each of the three towns, Joplin, Webb City, and Galena. Joplin, with its good streets, gas and water-works, machine-shops and foundries, flour and woolen mills, lead and zinc furnaces, street-cars, and extensive jobbing and retail houses, has been built almost entirely from the profits of mining.

Granby, twenty miles southeast of Joplin, presents a striking contrast. It is dependent on a single railroad, which owns much of the mining land; and the land is all leased or owned by the Granby Mining and Smelting Company. Lead ore has been extensively mined since 1856, and during the war the mines were worked for both armies. The zinc ore obtained is mainly calamine, but blende is also found. The mines are in general shallow and less troubled with water, the ores usually require less mechanical dressing than at other points in the lead region. The company receives from the men all of the lead and zinc ore, deducts the royalties paid to the railroad and its own royalties, and pays the miner on a sliding-scale, based on the price of the metallic lead and the selling price of zinc ore, for the reason that it smelts the lead ore, and at present sells the zinc ore.

This mining point is noteworthy, as it is the only one producing large amounts of calamine. The calamine is naturally rich, not much contaminated with other materials, and occurs with the lead ore in shallow horizontal openings. It was first utilized in 1871, prior to which time large amounts of it had been discovered and left in the ground or thrown aside. Since that time, it has been extensively mined, and has added greatly to the prosperity of the mines. Calamine is by nature less rich than blende in the proportion of 53 to 67 per cent; it is also much more difficult to clean when mixed with rock, on account of its lower specific gravity; but in proportion to the metal it contains, it is more valuable than blende, because it can be smelted more cheaply and the metal more perfectly extracted from it, and when mixed with blende in the furnace charge, it makes it possible to get more metal out of the blende. It is also valuable on account of the superior softness and toughness of the metal obtained from it; but it will not bear transportation to a distance as well as blende, on account of its lower percentage of metal. This ore has been at times the principal supply of the Carondelet Zinc-Works; large amounts of it have been shipped to La Salle and Peru; and in 1874, 4000 tons were shipped to Bethlehem, Pennsylvania, which yielded a little over 32 per cent of metal on the weight of the raw ore. It is less favored by the zinc-works in the neighborhood, because the freight upon it is heavier than the freight on ore from other points, and because furnaces working it can not turn out as many pounds of metal a day as when working on blende, and the output of the works is reduced.

(TO BE CONTINUED.)



THE MASON REGULATOR.

THE MASON REGULATOR.

The Mason regulator, illustrated by the accompanying drawings, is designed as a governor for all kinds of direct-acting steam-pumps, engines, and water-wheels. Its principal advantage lies in the fact that it is attached directly to the piston-rod or other working part of the machine without the use of belts, pulleys, or gears. The working parts being wholly immersed in oil, and no packing being used with the exception of one bearing, the regulator will never wear out or get out of order.

The regulator, which is manufactured by the Mason Regulator Company, of Boston, consists mainly of a cylindrical shell or reservoir filled with oil or other liquid. A plunger *A A*, connected by the arm *I* to some reciprocating part of the pump or engine to be governed, works horizontally and in unison with the strokes of the main engine into the pu mp-chambers *J J*, thereby forcing the oil into the chamber *E*, whence it returns through the orifice *C*, to be re-pumped as before. In case the engine acts more rapidly than is intended, the liquid is forced into the chamber *E* faster than it can escape through the orifice *C*, thereby raising the piston *F*, which shuts the throttle through the action of the lever *L*. As the orifice at *C* can be enlarged or diminished by means of the screw-valve, it will be seen that the action of every portion of every stroke can be controlled at the will of the engineer.

The small cylinder seen at one side of the reservoir, near the top, is filled with oil or other liquid, and fitted with a piston which connects with a weighted lever. This piston is provided with a small opening which allows the oil to pass from one side to the other as it rises and falls; the duty of which is to prevent sudden or irregular movement of all the connected parts.

THE SMELTING OF ARGENTIFEROUS LEAD IN THE FAR WEST.*

By O. H. Hahn.

(*Concluded from page* 133.)

Conditions for Economical Working.—It is obvious that smelting can be conducted most cheaply at a point where ores of a different character find a joint market, and where, at the same time, railroad facilities enable the smelter to procure his fuel, flux, and other necessary materials, and ship his product at low rates of freight. Such a place is Leadville. There we have siliceous, ferruginous, and calcareous ores, which can be combined with each other in such a manner that the least possible quantity of flux is required to smelt them properly; there we have cheap fuel also. But competition has assumed such proportions at Leadville that it requires no small amount of commercial skill to purchase ores in suitable proportions to flux each other, and large smelting capacity to make the business profitable. The advent of the railroads has been of immense benefit to the camp, and the increase of capacity has reduced the cost of labor almost one half, as a comparison of the following figures will show:

The average price of fuel in 1879, when the terminus of the railroad was thirty-five miles away, was for charcoal, 14 cents per bushel of 14 pounds; coke, $36.70 per ton of 2000 pounds. In 1882, charcoal, 10½ cents per bushel; coke, $15 per ton.

The average cost of fuel per one ton of ore was: In 1879, $8.92; in 1882, $5.66.

In 1879, we had, however, much more favorable ores to smelt, which accounts for the difference not being larger in proportion. The cost of labor, when we had to worry along with two 42-inch circular furnaces in 1879 was $5.20 per ton of ore; and in 1882, when we ran five large furnaces, $2.79 per ton.

Tendency to Increase of Capacity.—This will at once show that large capacity will materially decrease the cost of labor. There is a growing tendency now to establish smelting-works in even more central points, where competing railroads intersect each other, and where the items of fuel and labor are open to still further reduction—like Denver, Pueblo, and other places. In Denver, are the extensive Grant Smelting-Works, which, for convenience of construction, effective work, cleanliness, and architectural beauty, yet seek their rival. In Pueblo, is the largest and most complete establishment in the United States, that of the Pueblo Smelting and Refining Company, with its multitude of roasting-furnaces and blast-furnaces, its sampling machinery, and its refining plant; and there is still another plant in course of construction in the same town, that of the Colorado Smelting Company. In regard to individual capacity of furnaces, the Richmond Company, of Eureka, is ahead of all others, if we may accept the statements of the Eureka *Sentinel*, which, in its issue of August 29th, 1879, gives the following items about a new furnace then building there:

	Feet.	Inches.
Length inside jackets	10	8
Width inside jackets	8	4
Hight of jackets	2	6
Hight of furnace from bottom of crucible to feed-floor	16	..
Number of tuyeres	17	..

Smelting capacity, 100 tons.

Considerable stress is laid on the number of bars which this furnace will produce per shift. I should not like to run a furnace of such dimensions; not that I care for the inside length of the jackets, but the width is monstrous, and must require a blast of five pounds to the square inch to penetrate the charge. I hope, for the intelligence of the constructor, that the *Sentinel* is in error.

Furnace Reactions.—The reactions taking place in the blast-furnace have been so often described that it is superfluous to go over the same ground again.

Operating Lead Furnaces.—In regard to furnace manipulations, only a few remarks need be made. In blowing in a furnace, it is advisable, after the hearth has been heated up sufficiently, to charge it with alternate layers of fuel and bullion, and afterward with light charges of smelting mixture and slag, to the top, before turning on a weak blast. The hearth should contain so much bullion that the latter will rise to the top of the hearth in the channel forming the automatic tap. A hearth of 3 by 6 feet 6 inches by 30 inches deep requires nearly 11 tons of bullion to fill it up. I have had occasion, however, several times to blow in furnaces in new districts where no bullion could be had to start with. In this case, the automatic tap was closed at its lowest interior opening with a clay plug, which was removed after the lead showed itself at the slag-spout. This is not a very agreeable operation, inasmuch as the formation of a bottom crust is unavoidable, and this can only be perforated, but not removed by skill or by force, while the furnace is in operation. As long as the communication between the furnace and the channel can be kept open by driving holes through the crust, smelting may proceed; but as soon as this method fails, it is best to blow out the furnace at once. If the furnace is in good working order, when it is *open*, the lead in the tap-channel or well must be of a bright red color; frequently it emits arsenical fumes, in which case it should be covered with lime or ashes, which may be removed before dipping or tapping. The well should also work with the blast; that is, the lead should go down in the channel when the blast is shut off and rise again as soon as the blast is turned on. This is well known by the furnace-men, who begin testing their well as soon as the lead begins to assume a dark color and a sow makes itself felt in the furnace. Usually, there is a tuyere above or near the lead-well. By taking off the cap of the tuyere-pipe and replacing it, the same object is reached as by taking off the whole blast and turning it on again. The presence of a sow makes itself also known at the top, as it begins to blaze up now and then, and as the charges refuse to descend. A change in the composition of the charge is needed, or a water-jacket which may be leaking into the furnace requires to be taken out. The cause is easily discovered and remedied by the metallurgist, yet it takes time to improve a furnace by changing the charge. In a charcoal furnace, a new slag will show itself after the lapse of two or three hours; while in a mixed-fuel furnace it will take six or seven hours. To enable the furnace-man to dip the lead in proportion to its percentage in the charge, he should be informed how much of a bar or how many bars are contained in a charge. He will then know whether he should keep his lead high or low in the hearth. If there is little lead in a charge, say seven or eight per cent, great care must be taken to prevent the lead in the hearth from being lowered so much that a crust would be formed by the chilling of matte or speiss when it gets too far below the tuyeres. Below the tuyeres, the separation of the molten masses according to their specific gravity takes place in the following order: lead, which is of course alloyed with the bulk of the gold and silver contained in the ore, at the bottom; speiss floating on the top of the lead; matte floating on the top of the speiss; and lastly slag. In most places, slag, matte, and speiss are run out together into a slag-pot, which is allowed to cool and is then emptied of its contents. The three products are separated in three distinct horizontal layers. The matte from zinciferous ores makes an exception; having a lighter specific gravity, approaching that of the slag, it does not separate in a horizontal layer, but is scattered through the slag as a scummy mass. An addition of copper pyrites establishes a perfect separation in such a case. If metallic zinc forms during a smelting operation, the blast will blow a portion of it out through the slag-hole, whence it appears in its oxidized state as yellow powder, which on cooling turns white. Another portion of the zinc is volatilized in the shaft of the furnace, and will appear as a white powder in the flue-dust.

Variations in Practice.—The manner in which smelting mixtures are made is not the same in all works, nor is the system of feeding or charging the furnaces the same. In some smelting-works, the weight of the fuel is stationary, that of the charge or quantity of smelting-mixture corresponding to the fuel variable; in others, the fuel is variable and the charge stationary; in still others, the weights of both are variable. The latter plan is an irrational one. I prefer the one where the charge is stationary and the fuel variable, because the furnace is less sensitive to a large quantity of fuel taken off than to changes of charge.

The weights of both fuel and ore charges should be adapted to the area of the furnace at the throat, covering it in thin layers. For a furnace which has an area of 4 feet 8 inches by 8 feet 2 inches at the throat, a good proportion is from 192 to 216 pounds of fuel (half charcoal, half coke) and from 800 to 900 pounds of charge, which is fed into the furnace in half-charges through two doors, and spread uniformly over the fuel. The furnace is kept filled up to the bottom of the charge-doors. The feeding is done by hand, by means of shovels; but it seems that experiments with automatic feeding apparatus ought to be renewed, as they have not had a fair trial.

The best plan for making a smelting-mixture or charge, as it is also called, is of course to mix a large number of tons of ore with iron ore and limestone, or whatever the flux may be, and then weigh out the charges to the feeder. But wherever there is a variety of ores of different character which may vary in moisture, size, and other conditions, an immediate mixture with the fluxes will hardly give a homogeneous material which will make itself felt in the slag. In this case, it is better to weigh each component part of a charge or a half-charge separately into a wheelbarrow or car, and dump it at or into the furnace. A furnace of the above dimensions will take seventy charges per twelve hours, and will require eight men to serve it.

Furnace Products.—The products of smelting may be—

1. Silver-lead, argentiferous lead, also and preferably called "base bullion" in this country, in distinction from gold and silver bullion. This is a remarkable product, and is sold to the highest bidder. There are a number (ten or eleven) of refineries in the country which make it their object to separate the silver, lead, and gold, and to utilize the by-products gained in the refining process.

2. *Speiss.*—This is not utilized anywhere in the United States.

3. *Matte.*—This is either roasted and smelted again or thrown over the dump.

4. *Slag.*—This is only partially re-used.

5. *Furnace Accretions.*—There are two kinds: wall-accretions and hearth-incrustations or sows. The former consists of sulphide of iron in combination with sulphide of zinc and sulphide of lead, and they contain a small amount of silver. They should be roasted before resmelting; but as most smelting-works have no facilities for doing this, they are usually thrown on a charge. The hearth-incrustations do not contain enough silver and lead to make it worth while to have them broken up and resmelted. They are thrown over the dump.

6. *Cleanings, Furnace Refuse.*—These are fragments of bricks with metallic lead adherent: they are roughly assorted and the waste thrown away.

7. *Flue-Dust.*—This is the most important product aside from the lead. As it contains the finest and, in some cases, the richest particles of the ore in admixture with the dust of coal and coke, it is, of course, worth while to save and rework it. Where much fine ore is smelted, as was the case in Eureka during several seasons, the formation of flue-dust amounts sometimes to 15 per cent of the weight of the ore. In the face of this, it is to be wondered at that so many hundred, nay even thousand, tons of flue-dust were blown to the winds before provision was made for saving it. The Richmond Company, at Eureka, was the first to go to work in earnest by building spacious flues for catching the dust escaping from the furnaces; the previous attempt at the Ruby Consolidated works having been a failure.

The great question heretofore has been to get the flue-dust in such a form that it will stay in the furnace and not be blown out again. Simply wetting it is not of much use, and is even injurious to the furnace, as it will form wall accretions which grow thicker and thicker very rapidly. Mixing it with slacked lime has also its drawbacks, as it contains coal-dust, which has a tendency to counteract the agglutinating power of the lime; therefore, from eight to ten per cent of lime is at least necessary to make a mortar which will harden. I have found that sulphate of iron, the copperas of commerce, is the best agglutinator, but it could only be used where it is cheap. Thoroughly incorporated with a solution of copperas and made into bricks, which are dried in the sun, the flue-dust becomes as hard as rock, and is in the best shape for smelting. I once suggested, in 1878, the use of a brick-machine to make the flue-dust into adobes (with lime, of course); but the season was too far advanced, the bricks froze, and on thawing burst, and the experiment was given up. At the Germania works, the flue-dust was sintered in a roasting-furnace,

* From advance-sheets of *The Mineral Resources of the United States*, published by the United States Geological Survey, Department of Industrial Statistics. Albert Williams, Jr., Chief of Department.

which is the best but not the cheapest way. The most common plan now is to work it up with lime and use it along with the ore as fast as it is made.

Losses.—In roasting, as well as smelting, there are certain losses which can not be avoided entirely, but which may be reduced to a minimum. In roasting an ore; it first experiences a loss in weight, owing to the chemical reactions taking place; it loses water and carbonic acid; sulphides of metal are converted into oxides, and thereby decrease in weight. If the roasted ore will then show more silver by assay than the crude ore, this would prove that no loss of silver had taken place. If roasting is carefully conducted, the loss of silver by volatilization should not be over three per cent; but antimony, arsenic, and zinc cause a much higher loss by carrying off silver along with them to an extent which, if the temperature has been too high, may approach 20 per cent. I am not in possession of correct data from works where roasting is carried on, as in Montana and Northern Arizona. The cost of roasting at Robinson, Colorado, was nearly $6 per ton.

The losses in smelting are caused by the formation of speiss, matte, and other by-products which are thrown away. Slag also will cause a slight loss in metals, even if of normal composition. Zinc-blende will increase the loss in the slag considerably. The loss by volatilization is very slight so far as the silver is concerned, and may be entirely avoided by having enough lead in the charge to "cover" the silver. It is, however, not known what exact minimal quantity of lead is required to cover a certain quantity of silver and prevent loss. Smelting in Leadville has proved the fallacy of Kerl's statement that 300 times the amount of lead is required to cover one unit of silver. The volatilization of lead is very large where charges low in lead are smelted; as in Leadville, where frequently charges containing only 7 per cent of lead are treated. The loss of silver at Leadville is between 3 and 4 per cent, while the loss of lead from all sources amounts to from 13 to 15 per cent. At the Horn-Silver works, the loss of lead is stated at 8·71 per cent, but there they treat charges richer in lead.

FURNACE, MILL, AND FACTORY.

The Chalmers & Spence Company, of this city, manufacturers of asbestos materials, has recently covered the pipes of the Brooklyn Bridge. The company has also taken a contract for covering all the boilers, superheaters, etc., of the Atlas line. These vessels were built on the Clyde, but all the covering put on by the builders has been removed and replaced by the Chalmers & Spence Company's well-known air-space covering.

The Harrisburg (Pa.) *Patriot* says that the new Harrisburg & Western Railroad Company (Vanderbilt's Southern Pennsylvania line) has purchased the Wister Furnace at Harrisburg for $60,000. The land gained by this purchase is twelve acres in extent. In accordance with the terms of sale, the furnace has blown out and stands idle; it will torn down. It is now definitely known that the Wister Furnace property is to form the site for the car-shops of the Vanderbilt road.

The Florence furnace, Mich., which has been idle for a few weeks, to allow of needed repairs, went into blast again this week.

McIntosh, Hemphill & Co., Pittsburg, are running to their full capacity in building nail machinery, nail-machines, and heavy castings. Owing to the fact that some of the factories are beginning the manufacture of nails from steel, a remodeling of the nail-machine is necessary, which is one cause for the increased demand.

The work of putting the Grace furnace, Mich., in shape to go into blast has been commenced by Messrs. Sturges, Kruse & Travers, under the supervision of Matthew Travers.

W. S. Bostwick & Co., of Pittsburg, manufacturers of brass castings, report business very brisk. They have booked orders in the last two weeks for over 50,000 pounds of car brasses. Last week, they shipped 15,000 pounds to the Mexican Central Railroad. Orders for rolling-mill work are also very numerous. They expect to begin the use of natural gas under their furnaces this week.

The Meyer blast-furnace at Fond du Lac, Wis., is to be started up on October 1st. This property has lain idle for a number of years.

Reeves Brothers, purchasers of the rolling-mill at Canal Dover, have definitely decided to remove it to Niles, O., and place it in operation. The process of shipping it has already begun, but the location in Niles has not yet been settled.

The Pottstown, Pa., *Ledger* of August 23d says that on Friday the Phœnix Iron Company made the first experiment in rolling steel, and it was entirely successful. An angle bar 3 by 4 was turned out. The company intends making a business of this, and will go into it for the purpose of supplying steel for shipbuilding. It is contemplated in the near future to erect immense steel-converting works. This will give work to a very large number of men. The change in the business necessitates this move, as steel is fast superseding iron in manufacturing, and it does not pay to buy steel ingots for rolling when it is possible to manufacture them.

Spaulding, Jennings & Co. have remodeled their plant in their rolling-mill at West Bergen, N. J. They have disconnected their three-high 9-inch train from the main engine, and are driving it independently by a Westinghouse engine of 150 horse-power. The engine is 14 by 14, and runs 300 revolutions. It stands between the train and the polishing-rolls, and drives each by a separate belt. The belt driving the train has a speed of over 7500 feet, or nearly a mile and a half per minute. This is possibly the highest recorded belt speed, and is entirely successful.

Sweeney & Son, of Wheeling, recently cast a lot of ore-crushed chills for the Ætna mill, and two large water-boshes for the Whittaker iron-works. Cox & Morrison are rushed with work, and will employ several additional men at their boiler-works next week. The foundry of J. M. Woodcock, at Bridgeport, started up last Monday. A new engine has been put in, the floor-room enlarged, and other improvements made the past six weeks, during which time the foundry has been closed. L. B. Purdy and William Blake have returned to Moundsville from Pittsburg, where they contracted for the engines, boilers, and hoisting apparatus for the Moundsville coal-works. The coal will be hoisted by two twin engines, 10-inch cylinders, 24-inch stroke. Steam will be supplied by a 43-inch boiler 22 feet long, with two 15-inch flues.

The Johnstown Street Steel Rail Company has begun the manufacture of the rails at the Cambria Iron-Works. The rail has the ordinary L face used on the street railroads, but the body and bottom are made like the T rail. This form obviates the use of wooden stringers, as the rails can be spiked directly to the cross-ties and connected by splice-bars, making a continuous rail. They are made of Bessemer steel.

The Sunbury, Pa., Nail, Bar, and Guide Iron Manufacturing Company has built a rolling-mill and nail factory at Sunbury, which will be put in operation in two weeks. The works consist of two double puddling-furnaces, one heating-furnace, one train of rolls, 15 nail-machines ready for work, and 10 more machines on the way. John Haas is president of the company.

The Columbia Liberty Iron Company is the name of the new corporation that has purchased the Columbia and Liberty charcoal furnaces and some valuable mineral lands in Shenandoah County, Virginia. Mr. Samuel G. Merrick, of Philadelphia, is one of the leading members of the new company. Mr. Jacob Wissler will become superintendent of the furnaces.

Park, Brother & Co.'s Black Diamond Steel-Works, with their 17-ton hammer, have just finished the largest steel shaft ever made in the United States. It weighs 28,000 pounds, and is 34 feet 6 inches in length. The dimensions are 16¼ inches hexagon, or six square, tapered down to 14¼ inches hexagon at both ends. James Bridges and Mr. Bell superintended the manufacture. It was made for the St. Louis & Mississippi Transportation Company, of St. Louis, Mo.

It is proposed to convert the Columbus (Ohio) rolling-mill into a manufactory of truss, bridge, and structural iron. A year ago, the mill was equipped at great expense for the manufacture of steel rails, but the venture did not pay. The officers of the company, in a circular to the stockholders, say: "The time for making rails, either of iron or steel, has passed for the mills, as the larger companies, with their equipment of converters and expensive machinery, can always put rails on the market at a price that would be ruinous to the small producers. Other branches of the iron trade have been suggested, and it has been concluded, after thorough investigation, that the best field for our mill for the present would be in the manufacture of structural iron."

GENERAL MINING NEWS.

ARIZONA.

COCHISE COUNTY.

FIRST CHANCE.—The mill has been started up, and a full working force put on the mine. A shaft is sinking from the surface, to connect with the main winze (the mine now worked from the tunnel). When the connection is made, they will immediately erect one of Baker's California whims, and sink to the water-line; and after that is reached, will erect steam hoisting-works.

OLD JUDGE.—The shaft, now twenty-five feet deep, shows good ore, which assays from $12 to $35 per ton in gold.

GILA COUNTY.

GLOBE.—The mine is producing about 50 tons of ore a day, and running one stack, smelting the same. The slags of the former management assayed over five per cent in copper, while the new management claims to have reduced them to less than one and a half. A ten-ton silver smelter is erecting and about ready for operation, to work up the galena and carbonate ores of the camp. So states a correspondent of the Chicago *Mining Review*.

MACK MORRIS.—Operations have been suspended, and it is stated that the tools and other effects are for sale.

STONEWALL JACKSON.—The attempts to get the water out of the mine have not been successful.

GRAHAM COUNTY—GREENLEE GOLD MOUNTAIN DISTRICT.

GREAT WESTERN.—Work on the Olie mine, one of the properties of this company, is progressing favorably. A shaft 70 feet deep has been sunk, and it will be continued 30 feet farther, making the shaft 100 feet deep, when drifting on the vein will be commenced.

ORIENTAL.—At this mine, situated about seven miles from Clifton, there is an old open cut that was worked years ago by a prehistoric race, in which their stone hammers and other implements have been found; and about 100 feet north of the cut, there is an old Indian shaft, 15 feet deep, which shows a vein of very rich copper ore at the bottom.

PINAL COUNTY.

Mr. Zeckendorff is reported to have about 45 men at work on his copper properties at Riverside. The ores are a talcose slate, with native copper, being entirely free from oxides, carbonates, or sulphides. Concentrators are to be put up soon that will probably add not less than 10 tons of copper a day to the output of the territory. Several other claims in the neighborhood of the above property show ores averaging high in copper. West of Riverside some ten miles, is the copper property lately sold by Messrs. Jackson, Smith & Sharp, a horizontal deposit of high-grade carbonate copper ore. The new company proposes to erect smelting-works at once, and has sufficient ore supply to justify the undertaking.

SILVER KING.—A large amount of ore is produced. About 1000 tons are now on the dump.

YAVAPAI COUNTY—PECK DISTRICT.

BLACK WARRIOR.—This mine is steadily producing ore, and at the same time dead-work is kept ahead so as to maintain good reserves. Advices up to the 31st ult. report the mine looking most favorably for a regular output. The company's mill has been much improved since its purchase in May last, and is making an enviable record. Report for the last week of August shows an average chlorination of 93¾ per cent, and of silver left in tailings 9⅜ per cent. The bullion is shipped to the company in New York, and is of high grade, usually ranging from 900 to 950 fine; recent bars, however, have fallen to an average of 860 fine, due to an increase of copper pyrites in the ore.

Mr. Archibald A. Alexander, the general manager, gives personal supervision of the mill, while Mr. T. J. Eaman, superintendent, is in charge of the mines. It is proposed to resume work in the company's Tuscumbia mine at an early date. The water supply at the mill has been greatly improved by the sinking of an additional well to bed-rock, where a good flow of water was encountered. A new steam-pump has been added, and the reservoir tanks are now easily kept full.

CALIFORNIA.

MONO COUNTY—BODIE DISTRICT.

BODIE CONSOLIDATED.—The official report for the week ended August 25th shows: Ore crushed, 155 9 tons; average assay value of pulp, $38.27 per ton; of tailings, $6.48. Bullion shipped, $7072.76. The west cross-cut, 1000 level, is 338 feet long, and the east cross-cut, same level, is 450 feet long. The west cross-cut No. 2, 1000 level, is in 63 feet. The south drift from bottom of winze No. 5 is in 71 feet.

STANDARD CONSOLIDATED.—For the week ended August 25th, the official report shows: Ore shipped to mills, 1407½ tons; bullion shipped, $13,663.46. The east cross-cut, 1200 level, is in 497 feet. The north drift No. 1, 1000 level, is in 304 feet, and shows 2 feet of vein. The south drift No. 2 is in 266 feet; the vein is 5 feet wide, and looks well. The west cross-cut from the north drift, 700 level, is 421 feet long, and is in hard ground. The south drift from the west cross-cut No. 1, 500 level, is 249 feet long, and shows the vein 3½ feet wide. The north drift is in 765 feet, where the vein is five feet wide. The uprise from the south drift is up 118 feet; the vein at this point is 5 feet wide. The uprise No. 2 from the north drift is up 55 feet, and shows 4½ feet of vein. The south drift No. 2, 385 level, is in 771 feet; vein 5 feet wide. The uprise from this drift is up 225 feet. The uprise from the north drift is up 225 feet. The stopes are yielding the usual quantity of good milling ore.

CANADA.

PROVINCE OF NOVA SCOTIA.

A brick of gold, weighing three hundred ounces, valued at $6000, was recently received at Halifax from the mines at Salmon River. It is the result of the past month's operations.

COLORADO.

CLEAR CREEK COUNTY.

The following is a statement of ore-shipments from Georgetown and vicinity during the month of August:

Shipments from	Tons.	Value in dollars.
Boston & Colorado Works	320	$32,528
Silver Plume Stamping-Works	182	24,388
Miners' Smelting Company	160	19,360
Morris & Noone	301	31,295
G. W. Hall & Co	27	5,886
Lawson and Silver Creek	250	33,000
Total	1,240	$146,457

The above statement does not include any ore produced in the lower end of the county, which amount would probably swell the above statement to quite $200,000.

CORRY CITY.—The ninety-foot shaft has been pumped out and drifting started east and west. There is a fourteen-inch pay-streak, the iron ore of which assays from 49 to 63 ounces. On the tunnel level, a stope is raising over the shaft. A twelve-inch streak of ore was uncovered there for twenty feet, assaying 280 ounces. An average sample from the tunnel level drift ran 250 ounces. It is the intention to erect a twenty-ton concentrator at the mine, within the next six months. The Diamond Tunnel Company, owner of the Corry City, has made liberal concessions, whereby the lessees have every inducement to put through such an enterprise.

DONALDSON.—There are thirty-six men altogether employed in and about the mine, thirty-three being tributers and three engaged in working the tramway. The tributers pay a royalty of 30 per cent. The net product of the mine is between $3000 and $4000 per month, mostly free-milling quartz from near the surface, the ore being milled in the company's mill at Idaho Springs; the average net value of the ore, both mill dirt and smelting, being about $25 per ton. It is the policy of the company to take out as little of the concentrating ore as possible until such time as the mill at Fall River is completed, which will be some time before the coming winter. The mill, which will have a capacity of about 100 tons per day, is up and inclosed, and a portion of the machinery on the ground. It will have direct communication, by Halliday wire tramway 3800 feet in length, with the mine (the tramway being already built and in operation as far as the wagon-road in Trail Run, a distance of 2508 feet), so that the cost of getting the ore from the mine to the mill will be reduced, the minimum not to exceed 25 cents per ton. The deepest working on the mine is about 3000 feet, and altogether there are about 3000 feet of workings, including shafts and levels.

FREELAND.—The second level below the Freeland tunnel is in a little over 200 feet, and will have to be driven something like 150 feet farther to catch the ore-chute.

INVINCIBLE.—An undivided half-interest in this mine, situated at the head of Chicago Creek, has been sold for $25,000.

SUMMIT TUNNEL AND MINING COMPANY.—This tunnel, which is one of the greatest enterprises of this county, has now reached a depth of 560 feet. The company has fifteen patented lodes running at right angles with its tunnel, none of which has been cut as yet. At a meeting of the company held at Idaho Springs recently, it was decided to sell 20,000 shares, the proceeds to be expended in the purchase of drills, air-compressors, etc., to drive the tunnel as fast as possible.

EAGLE COUNTY.

GOLD PARK.—John W. Bailey has filed a writ of attachment in the United States Court against this company for $62,125, and given bonds to the amount of $125,000. The attachment is made by Mr. Bailey, who has been president of the company, to recover for money to this amount, alleged to have been loaned by him to the company. The marshal has levied upon about a dozen mines belonging to the company located on Holy Cross.

FREMONT COUNTY.

SOUTHWESTERN MINING AND MILLING COMPANY.—The property consists of a group of seven claims. The ore is an argentiferous galena carrying some gold, and the claims with additional development will become profitable producers. This company has an iron carbonate lode exhibiting more than twelve feet of carbonate ore of fair quality.

GILPIN COUNTY.

RARA AVIS.—The mill is to be started up shortly.

GUNNISON COUNTY.

A correspondent of the Denver *Tribune* writes from Irwin that the camp shows more activity in its mining interests than at any other period since its discovery. Machinery is placed and in working order in all of the prominent mines; leases and bonds are secured on some valuable properties, which are rapidly developed either in the interest of the lessees or to further their sale. The concentrators and sampling-works are running day and night, and the amount of ore shipped will not fall short of $35,000 a week. This is not inconsiderable, when it is considered that the amount shipped is produced only in development-work, advantage being taken of the present dry season to make preparations for the taking out of ore later on.

The McDonald-Wilder concentrator started its machinery on the 20th. The works have a capacity of 25 tons in twenty-four hours, and have been running without intermission since the date above mentioned. The character of the ore treated is ruby, native, and brittle silver and zinc-blende.

The Old Mexico & Durango has been shipping ore to the concentrator. The former is worked and yields large quantities of from 60 to 70-ounce ore. The Durango will start up soon, and the lower workings, about 200 feet deep, be stoped out. In this mine, there is a large, continuous body of ore about three feet wide which will mill-run 70 ounces.

The Rose & Reed Company is building its new concentrator in connection with its complete sampling-works. It has contracted to handle the Forest Queen ore, which is now, as always, a large producing mine.

The Bullion King has its machinery in place. The shaft, which will be sunk 100 feet farther before starting levels, is already 120 feet deep, with a south and north drift 150 and 60 feet respectively. The drifting is done on the vein with 100 feet of stoping to the surface in south level. The mine has already shipped about $60,000 worth of ore, and has on the platform at the present time 150 tons of concentrating ore, which runs 40 ounces, all ready for shipment as soon as the Rose, Reed & Co.'s concentrator starts. It is the intention to continue sinking the shaft all winter. In a few days, men will be placed at work in the south drift. Both drifts are started at the 100-foot level.

The Ruby Chief tunnel is driven 187 feet, and will be extended 300 feet farther, to tap the shaft at a depth of about 110 feet, the shaft being at present 100 feet deep. The company has shipped about $25,000 of ore, and has at least 100 tons of 45-ounce ore on the dump, which is hauling to our local mills. This company will work all winter.

The Oakes is working quite a force of men. This property is developed by a tunnel 430 feet; two shafts, one of 75 feet and another 30 feet, with two levels 14 and 60 feet, all the workings showing minerals in place, principally ruby and native silver. The first-class ore will mill-run 200 ounces, and there are 50 tons of 50-ounce ore on the dump. Both shafts are sunk on the vein. In the 30-foot shaft, the pay-streak is three feet wide, and in the 75-foot shaft 18 inches, and will run in both about 60 ounces. The character of the ore is principally ruby and native silver, but is also rich in chlorides and sulphurets.

Messrs. L. R. and H. Thompson, with F. W. Fuller, have bonded the old Shick & Howard extension for $40,000. A body of ore has been exposed unequaled in size by any heretofore discovered in the camp. There are two cross-cut tunnels, each of 300 feet, both cutting the vein at a depth of 200 feet below the surface. The vein is fully 50 feet wide, between well-defined walls, with a pay-streak five feet wide which will run 55 ounces, the selected ore running almost 400 ounces. The old Shick & Howard extension is on the same vein, a spur only of which is at present worked. The ore is similar in character to its neighboring location, the Oakes, namely, ruby, native, and brittle silver, with chlorides and sulphurets.

The Forest Queen has a fine plant of machinery. No more ore than sufficient to pay expenses will be taken out for the present, as it is the purpose of the company to do only development-work. The shaft, which is 225 feet deep, will be worked to a depth of 600 feet. The ore-body is changing in character, the arsenical iron as depth is gained being replaced by galena and copper, ruby and native silver being as large in quantity as previously.

LAKE COUNTY.

A movement is on foot, says the Leadville *Herald*, having in view the consolidation of the Nisi Prius, Leadville, and other lode claims on Rock Hill, together with a large tract of placer ground, the whole to be included under one management, and started out with a working capital of $100,000. The scheme has but recently been suggested, and is still undeveloped. From all that can be learned, it is favorably received, and will unquestionably secure a hearty support. Among the persons mentioned in connection with the enterprise are W. H. Stevens, of the Iron mine, Dennis Sullivan, W. H. James, Governor Grant, James Dexter, and other prominent citizens.

COLONEL SELLERS.—Work was begun on the Sellers shaft in March, 1882, and during the month of September following ore was struck. A great deal of water being encountered, considerable delay was experienced in putting in a large Cornish pumping plant. The first shipment of ore was made about six months ago, and since then the mine has produced regularly. The ore throughout the mine is a sulphide, the base varying greatly. Sometimes it is mostly iron, again zinc predominates, while occasionally galena is greatly in excess. The product of the mine is sold to the Arkansas Valley smelter.

ELGIN SMELTING-WORKS.—These works, operated by the Manville Smelting Company, are doing a very satisfactory business. The smelter has two furnaces, and is producing about twelve tons of bullion a day. The company has large contracts with a number of heavy producing mines, and has excellent prospects before it. Its largest contributors of ore are the Adlaide, Climax Contract, Argentine, Oro City, and Gonabrod mines.

HENRIETT.—Preparations are making for working the upper shaft on the Henriett claim. This shaft is situated near the eastern end line of the Henriett, has a depth of 400 feet, disclosing the first iron, and has not been worked for two years past. It is generally believed that a second body of iron and pay-ore will be found with greater depth.

IRON SILVER.—One of the most important mineral strikes reported this year has been made in the Moyer shaft of the Iron Silver Company. The ore-body shows a thickness of about eight feet, and consists of galena, carbonate, and sulphate of lead ores, with very little iron pyrites. The ore also carries some native silver.

LITTLE CHIEF.—The recently reported new strike continues to hold out well, and the prospects of quite a bonanza are daily improving. The drift running in on the ore has advanced thirty-five feet, and the face shows fine carbonate and galena ores, as well as iron ore carrying a large amount of silver. The sides of the drift also show fine ore. The ore-body, according to all reports, is from five to six feet in thickness, with a length and width still unknown.

MATCHLESS.—The mine has just opened another rich body of chloride and horn-silver ore.

MORNING STAR.—Developments are of a most encouraging nature. A new strike has been made near the line of the Evening Star, and about the center of the Morning Star claim. The mineral is carbonate of lead, and carries from 50 to 200 ounces in silver to the ton. The mine is producing about 50 tons of ore a day. The sinking of the McHarg shaft has been resumed. Both of the new steam-pumps are working admirably, and are keeping the shaft free of water without any difficulty.

NILES-AUGUSTA.—The lessee of this mine, on Carbonate Hill, is shipping iron ore in considerable quantity.

ST. BERNARD & BROOKLAND.—An injunction has been issued to prevent the consolidation of the St. Bernard Mining Company with the Brookland, primary arrangements for such a consolidation having been made at a recent meeting of the former company.

ST. LOUIS.—During the past few days, the workings of the mine have disclosed improved grades of copper ore. Included in the recent discoveries is copper glance, the first yet found in Lake County, from all that can be learned. The mine extends great promise of being a large producer of a great variety of minerals. It is a fissure-vein, and its products are totally different from those of the contract properties in this section.

LA PLATA COUNTY.

A number of gentlemen, representing mining interests in various parts of the San Juan, recently held a meeting in Durango, and perfected an organization known as the San Juan Miners' Association. The general aim of the association is to promote the varied mining interests of the San Juan in every possible way. This includes united effort on the part of the miners of the counties of La Plata, San Juan, Dolores, San Miguel, Ouray, Hinsdale, and Rio Grande to place the mineral resources in a positive and well-defined position before the world; to create a feeling of friendly rivalry between these counties in the way of county ore exhibits; and to stimulate the miners of the San Juan to make as large an annual output of ore as possible.

OURAY COUNTY.

The Ouray and San Juan Tramway will be open to teaming by September 1st. Its main line extends from Ouray to Mineral City, a distance of nine miles, with branches to Red Mountain and Poughkeepsie Gulch.

PARK COUNTY.

LONDON.—The stamp-mill has again commenced active operations, and the Frue concentrators are doing all that was expected as far as can be determined from an examination of the tailings and concentrates. From this time on, a continuous run will be made, handling on an average forty-five tons per day.

PITKIN COUNTY.

FARWELL CONSOLIDATED.—The entire property, situated at Independence, is offered for sale.

RIO GRANDE COUNTY.

SAN JUAN CONSOLIDATED.—Last week, we reported that the controlling interest in this mine had been sold for $900,000. The Colorado papers which made this statement have since contradicted it, and state the amount to have been but $150,000.

SUMMIT COUNTY.

WHITE QUAIL.—The mine, which is leased, is producing about fifty tons of ore a day, the bulk of which is sent to the Greer concentrator.

DAKOTA.

CALEDONIA.—The superintendent reports for the week ended August 26th: Ore produced, 300-foot level, 1050 tons. On the 20th inst., we discontinued stoping on the 400-foot level, and started a drift across the ledge from the header, which

has advanced 11 feet. We have just started a drift south on the ledge. The ore milled now shows an improvement.

FATHER DE SMET.—Superintendent Webber writes, under date of August 19th: Have just arrived at this place, and have been put in charge of property by Mr. Gregg. I find every thing going ahead well, and working smoothly. The mine shows up favorably as to quantity of ore, and I presume the quality is about as usual, though, of course, I can not judge much about it yet, not being familiar with this kind of ore. I inclose you the express company's receipt for bar No. 165, containing 723¼ ounces gold, the result of run of mill for the first half of August. On August 15th, we drew for $23,000.

GEORGIA.

A survey is making from Kingsberry's Mill, on the Tallapoosa, to the Bonner gold mine, for the purpose of constructing works to convey the water to the mines.

The scarcity of water still prevents full operations at the mines in Lumpkin County.

IDAHO.

COLUMBIA & BEAVER.—The company's mill will be started shortly, on Silver King ore. A few lots of ore from other properties will also be worked. It is proposed to charge $35 per ton for working ores, and to guarantee a yield of 95 per cent.

DEER CREEK SMELTER.—The concentrating-works will be completed by the middle of September. By that time, there will be sufficient ore extracted to keep the concentrators at work steadily. The amount of ore out gives a good start to the miners, who are getting more out each shift and opening new stopes.

IDAHOAN.—The mine is worked by an upper and lower tunnel. The upper tunnel is in 525 feet on four feet of ore; a continuous vein of ore followed in from the ledge, with a ninety-foot winze on ore running to the lower level. The lower tunnel and main cross-cut are in 600 feet, and the face is 300 feet below the surface. The first-class ore will average 120 ounces silver and seventy-five per cent lead. There are fully 1500 tons of second-class ore on the dump. Ore is shipped to the Hailey Sampling-Works, and sold in Salt Lake City and Ketchum. The building of the concentrator, ore-houses, and other buildings is pushed with energy.

JAY GOULD.—Some 3000 tons of second-class ore are on the dump ready to be worked by the new concentrator, now in course of construction. The main tunnel is in 825 feet, and cuts the vein at a depth of 700 feet perpendicularly, or 900 feet on the pitch of the vein.

MAYFLOWER.—This mine is worked by two tunnels, 1252 feet in the upper tunnel on a continuous vein of ore. Three shafts are sunk from the upper tunnel, 100 feet each. The lower tunnel is 1000 feet on the vein, 36 feet wide. They have shipped 950 tons of first-class ore to the Omaha Smelting and Refining Company, Omaha, since April 1st, 1883, averaging 180 ounces of silver and 65 per cent of lead. The steam-jig turns out six tons of first-class ore daily, taking seven tons of second-class ore and ledge-matter to make a ton of first-class ore. Forty-six men are employed. The monthly expenses are from $6000 to $7000.

MONTANA.—A vein of gray copper ore has been struck.

PHILADELPHIA MINING AND SMELTING COMPANY.—The output of the works at Ketchum ranges from 350 to 450 bars daily, with an average weight of 100 pounds. For the purpose of protecting the water-power against cold weather, arrangements have been made with the Guyer Hot Springs, by which a steady flow of hot water through the smelting company's ditch will be obtained.

SMOKY BULLION & OPHIR.—The concentrating-works will be ready for work this fall.

SNAKE RIVER PLACERS.—The lands of the Upper Snake River Valley, north of Eagle Rock, according to a correspondent of the Salt Lake *Tribune*, are rapidly locating for mining purposes, and miles upon miles of stakes are seen on both sides of the river. Several companies are now successfully at work, but scarcely a beginning has been made. So far, every experiment under the present process of working has been a complete success. The first company above Eagle Rock, Messrs. Edwards, Quayle & Quirk, lately made an experimental run of forty days, and cleaned up $1060, doing all the work themselves and employing no help. The other companies are doing the same in proportion. Messrs Edwards & Co. say it will take them, at the rate they have been running, about four years to work out one acre of ground. At present, the mining is confined to that part of the valley watered by the Snake River Water Company's canal, and for years to come this canal can furnish all the water needed. The canal takes its water from the South Fork of Snake River, thirty miles above Eagle Rock, and has cost the company over $50,000 to construct. It carries a stream about twenty feet wide, varying from six to twelve feet deep, and can be enlarged to any required extent, the supply of water being practically inexhaustible. The company is now furnishing water to all the miners on very easy terms, in order to encourage the working of the placers, and expects another season to be called upon to furnish water for fully one hundred claims. The contrivance for saving the gold is simple and cheap. Any jack carpenter can make the machine, and it is safe to say that the entire cost of the gold-saving apparatus is easily covered by an expenditure of less than $200. A stream of water carries the gravel through a common sluice-box having a common grizzly. Toward the end of the sluice-box, the black sand and gold-dust are carried through a hole in the bottom of the sluice into a system of shallow boxes carpeted with common burlap cloth; here the gold catches in the burlaps, which are periodically taken up and washed out in a tub and then replaced in the same boxes again. The number of machines which can be used is only limited by the number of hands employed and the volume of water at command.

WOOD RIVER.—The Bullion mine, the property of this company, is shipping twelve tons daily of first-class ore to the Omaha Smelting and Refining Company at Omaha, averaging 180 ounces of silver and 65 per cent lead. The mine has been developed by over 6000 feet of drifts, tunneling, and winzes. The mine has 700 tons of second-class ore on the dump, which will be concentrated about four tons into one ton of first-class ore. The company is working 100 men. The concentrator has been finished, and works well.

YELLOW JACKET.—The ten-stamp mill, which was erected only as an experiment, has given such satisfaction that next year a 100-stamp mill will be erected.

MAINE.

CUMBERLAND COUNTY.

A valuable feldspar mine is said to have been recently discovered in the town of Raymond, on land belonging to the estate of William Mayberry.

MEXICO.

From Parral, we have the following letter: There are new discoveries of rich ores of silver made within the municipal limits of this city almost every day. English, French, German, and American capital is largely investing in the mines in this vicinity, and new works are in course of erection to beneficiate the finds. Anastacio Porros, the mayor of Parral, is erecting a large concentration, lixiviation, and smelting-works. Frederick Stalforth, one of the leading citizens and bankers of this city, has in contemplation the erection of large reduction-works on the celebrated Veta Grande mines. Thomas Parker, of Texas, J. H. Johns, of Kansas City, and Capt. John McCasey, of New York City, are about to build lixiviation-works, some ten miles from this city, to beneficiate the ores of three old Spanish mines of great wealth, the ores of which average ninety-five ounces to the ton, while the average width of the veins is six feet. There is a great abundance of wood and water on the property.

The twenty-five stamp-mill of the Parral Milling and Mining Company is rapidly approaching completion. The general superintendent, Capt. John McCasey, has ten stamps of the new mill running. The mill operates splendidly. The erection of the Stetefeldt furnace is progressing rapidly; the chimney is finished. It is the highest in Mexico, being 103 feet above the grate-bars of the roaster. The old fifteen-stamp mill of this company is running steadily on ore from the Jesus Maria mine. Lixiviation is the process adopted. Superintendent McCasey maintains that lixiviation is the best and cheapest process that can be used to beneficiate the ores of this vicinity. The Sestin Land and Mining Company, of Carmen, Durango, is working ores by the patio process with good results. There is now on the ground all the necessary material for the erection of a ten-stamp mill, the machinery for the same having been furnished by Ribon & March, of Jersey City. N. A. Cowdrey is the president of this company; L. C. Palmer, general manager; and C. H. Ward, superintendent. The Philadelphia syndicate is pushing work on the Gilarania. A depth of 240 feet, and in good ore, has been attained. Parral promises to be a very lively camp this winter.

PARRAL, MEXICO, Aug. 23. M. H. LEWIS.

The Mexican *Financier* says that Major Halliday, of St. Louis, has bought a large number of gold and silver mines in the State of Guerrero, and has started for the States by the overland route through Querétaro, San Luis Potosi, and Monterey, to purchase the machinery and material for three separate plants to work the mines according to the best modern methods. The plants will comprise reduction-works, smelters, and amalgamation-pans.

With a few exceptions, says a correspondent of the Mexican *Financier*, the mines at Pachuca are looking well, and there appears to be a general expectation of a boom shortly. Holders of shares will not sell except at prices considerably above market offers, and there appears to be a general determination to hold on for the rise. Santa Gertrudis is giving good results, those from the south lode especially being eminently satisfactory. The majority of the shareholders are greatly dissatisfied with the careless superintendence and want of proper economy on the part of the direction in supplying sufficient timber to render the shaft secure, a fault which caused the recent caving in of the shaft.

The Encino mine is going on well, and rich developments are expected shortly.

The New Rosario also looks promising and is worked steadily. Several mines in this neighborhood are not now running, from want of capital, notably the California. If outcroppings are any indication of the riches concealed below, then this writer says that the legendary output of the Conde de Regla is in a fair way of being surpassed.

There are several other good undeveloped mines around the neighborhood of Pachuca and El Chico, but until within the last two or three years it was not safe for the foreigner to prospect even, much less work a mine.

Another correspondent states that the Progreso hacienda has at last started up. What the results of their very much mixed ancient and modern methods will be, remains to be seen.

The Gertrudis has recently had quite a bit of bad luck, caused by the heavy rains, about 100 varas of the San Miguel shaft having caved. It is the intention to sink a new shaft at once.

The Anglo-Mexican Copper-Works seem to have a brilliant future. They are hurrying out a No. 1 copper very fast.

The Pachuca River Company is pushing on its operations at a very rapid rate. The concentrating machinery is nearly all erected.

La Blanca mine is sinking its perpendicular shaft fast. It is now down about 100 varas.

San Cayetano el Bordo, under its new management, has taken quite a step up, though considerable work has been done building walls, sinking a new shaft, etc. At the half-yearly stockholders' meeting, a good cash balance was shown.

REAL DEL MONTE.—A dispatch from the City of Mexico states that it is reported that an American syndicate has purchased this company's mines at Pachuca for $4,000,000. The Real Del Monte Company has turned out a success.

MICHIGAN.

The Marquette *Mining Journal* gives the following table, which exhibits in gross tons the total lake shipments of iron ore from upper peninsula ports the present season, up to and including August 29th, together with the amount shipped from the same ports during the corresponding period of last year:

Name of port.	1882.	1883.
Escanaba	1,159,759	875,783
Marquette	655,410	417,985
L'Anse	39,245	42,305
St. Ignace	27,095	19,476
Total	1,881,509	1,355,549

Showing a decrease of 525,950 gross tons.

CHAMPION.—At this mine, the work is confined exclusively to sinking and opening up new ground, all the upper stopes being left intact.

HURON.—The new stamp-mill is giving most excellent satisfaction, while the mine underground never showed better for copper. The product in August will not be far from 55 tons.

IRON RIVER.—A large amount of ground is opening up. It is the intention of the management to employ a large force during the winter, principally in doing preparatory work, while in the mean time a new engine-house will be built and a plant of machinery put in. Stripping will be prosecuted all along the line, the intention being to open up the vein over its entire length—or at least so far as is found on the company's lease-hold.

NONESUCH.—Quite a number of miners are now at work, opening new ground west as rapidly as possible, while others are engaged in sending rock to the surface, which is crushed and put into the hoppers ready for the mill to start. In the mill, they are washing the sands accumulated on the floor. They are also erecting two more of Evans's slime-tables. When they are completed, the stamp-mill will be again started.

ROLLING-MILL.—Negotiations for machinery are going on. The property is to be worked to its full capacity next season.

ROPES GOLD AND SILVER MINING COMPANY.—Another shaft is sinking on this property, about 600 feet east of the Curry shaft, and which is looking well, the lode having similar proportions and characteristics as shown in its Western neighbor. Other shafts on the vein will be sunk shortly.

SPURR.—Operations have been suspended.

WEST CHAPIN.—The find of ore is just sufficient to warrant a continuance of work. An analysis of an average sample from the deposit gave: Metallic iron, 55·27; phosphorus, trace; silica, 18·51.

MONTANA.

LEWIS & CLARKE COUNTY.

A correspondent of the New York *Tribune*, speaking of Helena, says that it is not only in the center of a rich mining country, but it was itself originally a mining camp. Last Chance Gulch, in which the main street of the city is built, was formerly one of the richest placer-mining regions in the world. It is said by old-timers that $20,000,000 have been taken from the ground upon which the city stands. Two years ago, the Odd Fellows' Hall was built, and gold-dust to the amount of $1400 was washed from the dirt taken from the cellar. Every foot of ground in the city has been dug up and washed over again and again by the industrious placer-miner, and within a mile of the main street placer-mining is still going on. Evidence of mining, in the form of irregular heaps of gravel

and stones, can be seen on every hand. In the early days—a few years following 1865, when the first settlement was made—gold-dust was the only medium of exchange. Coins and greenbacks were unknown.

SILVER BOW COUNTY.

ALICE.—In the 800 foot level, at a point 105 feet west from the main shaft, the main ore-chute that has run the entire length of the Alice property, and been found in each succeeding level from the top to the bottom, has been tapped. Work in this level is pushed, and the baby-hoist on the 700-foot level materially facilitates progress, as well as cares for the water that is encountered. The winze from the 200 to the 300-foot level, at a point 185 feet east from the shaft, is expected to be finished shortly, and connection made below. The ore-body in this winze is of a uniform width of four feet, and of an average value of $100 per ton, although assays running as high as $250 and $300 have been obtained. On the 300-foot level, the same vein has been opened up both east and west; and on the completion of the winze above referred to, a body of $100 rock sufficient to run the mills two years will have been made available for easy extraction and hoisting. On the 400-foot level, prospecting is actively forwarded, to open up the same vein encountered in the levels above.

ANACONDA.—The company is pushing work on the smelter, upon which two hundred men are employed, in running the tunnel for the mill-race, building arches for the calcining-furnaces, laying the foundation-walls, grading for the concentrator, and lining the ditch with lumber.

BELL.—Some ore is hoisted from the old workings, but the greater part of the development is confined to the 400-foot cross-cut which is to connect the new workings with the old. The cross-cut is in about 105 feet, and when the length of 150 feet is attained, the connection will be finished, when active ore extraction will commence. At the smelter, the work goes steadily on, and about 40 or 45 tons of ore are treated daily.

NEVADA.

EUREKA COUNTY.

ALBION.—Some new ore has been opened out with fair indications. Prospecting is vigorously carried on by the company's men and by tributers, several of whom have good pitches.

EUREKA CONSOLIDATED.—The water in the mine is gradually lowering. The water in the old workings of the mine has gone down from above the 1200 level to about the 1300, and the shaft in the Phœnix has already been pumped dry.

LINCOLN COUNTY.

DAY.—The Pioche *Record* says: In working around the ore-chamber lately struck, three feet of copper ore were found on the east side of the ore-chamber. As soon as prospecting the ore-chamber is completed, the copper ledge will be prospected.

STOREY COUNTY—COMSTOCK LODE.

ALTA.—The work of pumping out the lower levels will occupy three or four months.

HALE & NORCROSS.—Through the stoppage of the pumps, work in the winze below the 2600 level has been a good deal retarded. It is found, however, that the donkey-pump is able to clear the winze of water very rapidly.

MEXICAN.—The rock in the uprise from the 2900 level is exceedingly hard, and rapid progress can not be made. Until this hard streak has been cut through, the water will not begin to drain out of the winze down from the 2700 level.

OPHIR.—Good headway is making in opening out on the 150 level in the old ground.

OVERMAN.—It is said that the company contemplates buying the old Petaluma mill, in order to work the ore at present extracted from the croppings by means of a tunnel near the old Overman works.

UNION CONSOLIDATED AND SIERRA NEVADA.—The joint winze is making excellent progress, and will soon reach a point where it will cut the first of the quartz streaks passed through on the 3000 level by the main west drift. These streaks presented a very promising appearance where cut on the 3000 level, and showed a considerable amount of metal, silver greatly predominating over gold.

YELLOW JACKET.—Considerable work is done in the way of exploration.

WHITE PINE COUNTY.

WHEELER TUNNEL.—The tunnel is in 647 feet, and is directed to under-cut the Original Hidden Treasure mine. The face of the tunnel has lately encountered unusually favorable material, at a vertical depth below the surface of nearly 500 feet.

OHIO.

Reports from Cleveland state that there is great excitement throughout Trumbull County over the discovery of petroleum in the village of Champion, near Warren, and people are rushing to the scene from all points of Northern Ohio.

UTAH.

EMMA.—A shipment of fifteen tons of $160 ore has just been made. The 135-foot level is opened 80 or 90 feet west from cross-cut from shaft, and 125 feet east. The ground is said to be the most promising in appearance of any that was ever found in the mine. The vein is 150 feet wide. After being driven a suitable distance, the vein will be cross-cut from this level at promising points, and at enough of them to thoroughly exploit the entire ground.

ONTARIO.—The seventh and eighth levels have both been extended westward during the last few months from 500 to 600 feet in a strong body of as fine ore as ever was found in the mine. The ninth level has not been opened at all. The pumps are taking care of the water, including the last outbreak on the eighth level, and many of them will be relieved and the expense largely reduced when the sixth level tunnel begins to be used, which will be soon.

SAMPSON.—At present, work is principally confined to the sinking of the shaft, which is nearing 180 feet in depth. There is ore on hand, and more might be taken out; but while the shaft is going down, it is not yet determined whether they will drift to the vein, which the shaft has passed through, from the 200 station, or go on to the 300 with the shaft, first.

WYOMING.

The mines at Hartville are shipping copper matte regularly, and the new Silver Crown District bids fair to prove a producing one within a very short time. The Copper King mine, in this district, is a deposit of metallic copper, which, from the indications appearing on the surface, is thought to be about forty feet wide and from 5000 to 6000 feet long. The shaft has reached a depth of 70 feet. At about 75 or 80 feet, a cross-cut will be run to ascertain the width of the body of ore in the claim. Within two miles, in a northerly direction, is a deposit of galena, silver, and gold. One mile north of this are two veins, both of which are worked. In one, are found sulphurets of copper; and in the other, copper pyrites. All these claims look well. Several placer mining districts near Laramie are producing.

PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

GRANTED JULY 3D, 1883.

280,349. Composition to be used in Fluxing and Protecting Molten Metals. Francis J. Clamer and Joseph G. Hendrickson, Philadelphia, Pa.
280,425. Apparatus for Concentrating Sulphuric Acid. William West, Denver, Colo., Assignor of one half to Homer Pennock, New York City.
280,541. Pick for Mining-Machines. George D. Whitcomb, Chicago, Ill.
280,544. Coal-Mining Machine. George D. Whitcomb, Chicago, Ill.
280,668. Steam Rock-Drill. Joseph W. V. Rawlins, Houghton, Mich.
280,738. Miner's Lamp. Richard W. Grimes and John Fern, Scranton, Pa.

GRANTED JULY 10TH.

280,781. Mining-Machine. Hermann Barditzky, St. Louis, Mo., Assignor of two thirds to Andrew Brandenburger and William Tirre, same place.
280,824. Portable Forge. John P. Holt, Cleveland, O.
280,835. Compound Pump. Henry C. Langrehr, San Francisco, Cal.
280,838. Device for Burning Gaseous Fuel in Kilns. Burdett Loomis, Hartford, Conn.
280,903. Cinder-Car. Jerome L. Boyer, Columbia, Pa.
280,904. Hoisting Apparatus for Locomotive and Portable Engines. Jerome L. Boyer, Columbia, Pa.
280,909. Elevator-Bucket. Henry W. Caldwell, Chicago, Ill.
280,934. Ore-Concentrator. Artemas A. Kent, Denver, Colo.
280,954. Combined Steam-Boiler and Crucible-Furnace. Alexander Riegler, Cincinnati, O.
280,955. Combined Metallurgical Furnace and Water-Heater. Alexander Riegler, Cincinnati, O.
280,971. Steam Rock-Drill. Amos Stevens and Arthur L. Stevens, Philadelphia, Pa.
280,983. Tube-Coiling Machine. E. Walter Whitlock, New Haven, Conn.
280,994. Sampling Apparatus. George S. Andrus, Columbia, Colo.
280,997. Air-Compressor. William A. Babcock, South Coventry, Conn.
281,011. Hoisting and Conveying Machine. Alexander E. Brown, Cleveland, O.
281,022. Ingot-Buggy. Simon C. Collin, Braddock, Pa.
281,044. Process of Analyzing Pig-Iron from Blast-Furnaces. Samuel A. Ford, Pittsburg, Pa.
281,060. Amalgamator. William Hawkins and Henry R. Hawkins, Oregon, Mo.
281,063. Furnace and the Art of Working the same. James Henderson, Bellefonte, Pa.
281,074. Process of Extracting Precious Metals from Ores. A. K. Huntington, Hampstead, and Walter E. Koch, Kensington, County of Middlesex, England.
281,098. Device for Cooling Furnace-Fronts. William S. McKenna, Pittsburg, Pa.
281,159. Protecting Plumbago Crucibles. William Tatham, Philadelphia, Pa.
281,184. Roll for Slitting Iron. Howard Greer, Chicago, Ill.
281,212. Mode of Making Molds for Steel Castings. Benjamin F. Watkins, Johnstown, Pa.

GRANTED JULY 17TH.

281,242. Friction-Clutch. Hilen C. Crowell, Erie, Pa.
281,261. Steam Pumping-Engine. Harvey F. Gaskill, Lockport, N. Y.
281,272. Work-Holding Device for Metal-Slotting Machines. Charles Huke, Chicago, Ill.
281,284. Traction-Rope Railroad. Daniel J. Miller and Charles F. Findlay, Chicago, Ill.
281,366. Pile of Combined Iron and Steel. William G. Howell, Philadelphia, Pa., Assignor of one half to William Gerhard, same place.
281,385. Injector. William T. Messinger, Cambridge, Mass.
281,389. Injector. Horace B. Murdock, Detroit, Mich.
281,390. Water-Meter. Lewis H. Nash, Brooklyn, Assignor to the National Meter Company, New York City.
281,440. Traction-Rope Railroad. Adolphus Bonzano, Phœnixville, Pa.
281,446. Hoisting and Conveying Machine. Alexander E. Brown, Cleveland, O.
281,474. Rolling-Mill. Gustav Erkenzweig, Hagen, Prussia, Germany.
281,475. Rolling-Mill. Gustav Erkenzweig, Hagen, Prussia, Germany.
281,511. Machine for Grinding and Pulverizing Ores. William H. Howland, San Francisco, Cal.
281,528. Hoisting Apparatus. Henry B. Larzelere, Greencastle, Pa.
281,565. Manufacture of Explosive Compounds. Marc Eugene Sanlaville and Rodolphe Laligant, Quincié, France.
281,593. Traction-Rope Railroad. William Wharton, Jr., Philadelphia, Pa.
281,595. Rolling-Mill. Samuel R. Wilmot, Bridgeport, Conn., Assignor to himself and Willis F. Hobbs, same place.
281,596. Rolling-Mill Roll. Samuel R. Wilmot, Bridgeport, Conn., Assignor to himself and Willis F. Hobbs, same place.
281,597. Rolling-Mill Roll. Samuel R. Wilmot, Bridgeport, Conn., Assignor to himself and Willis F. Hobbs, same place.
281,625. Kiln for Firing Pottery, etc. Nancy M. Fitch, Auburn, N. Y., Assignor to Stearns Fitch, same place.
281,629. Amalgamating Apparatus. Alfred K. Huntington, Hampstead, and Walter E. Koch, Kensington, County of Middlesex, England.
281,635. Method of Treating Phosphates of Iron and Alumina. Albert H. Koefoed, New York City, and Thomas B. Stillman, Hoboken, N. J.
281,651. Combined Amalgamator and Separator. Theodore R. Timby, Nyack, N. Y.

GRANTED JULY 24TH.

281,700. Friction-Clutch. D. Randolph Kinyon, Raritan, N. J., Assignor of one half to Job C. Kinyon, same place.
281,718. Hand Rock-Drilling Machine. Henry F. Parsons, San Francisco, Cal., and Hugo Borchardt, Bridgeport, Conn., Assignors to Daniel Cook, San Francisco, Cal.
281,719. Rock-Drilling Machine. Henry F. Parsons, San Francisco, Cal., and Hugo Borchardt, Bridgeport, Conn., Assignors to Daniel Cook, San Francisco, Cal.
281,720. Mechanical Movement. Henry F. Parsons, San Francisco, Cal., and Hugo Borchardt, Bridgeport, Conn.; said Parsons Assignor to Daniel Cook, San Francisco, Cal.
281,729. Manufacture of Cast-Iron High in Carbon and Low in Silicon. Jacob Reese, Pittsburg, Pa.
281,735. Coal Cleaner. Joseph Snyder, West Pittston, and Dathan Morse, Hugheston, Pa.
281,746. Means of Attaching Elevator-Buckets to Belts. Frederick A. Wittich and Peter W. Strader, Ashtabula, O.
281,764. Furnace for Manufacturing Iron and Steel. James Henderson, New York City, Assignor of one half to Charles G. Francklyn, same place.
281,782. Ore Reducing and Separating Machine. Cortland E. Moore, Marquette, Mich., Assignor of two thirds to Henry C. Thurber, same place.
281,784. Process of Treating Iron. George Neilson, Chelsea, Mass.
281,810. Brake for Winding or Hoisting-Engines. William C. Waters, San Francisco, Cal.
281,815. Grip for Endless-Cable Ways. Levi J. Wing, Brooklyn, N. Y.
281,828. Movable Jaw for Stone and Ore-Crushers. Daniel Brennan, Jr., Orange, N. J.
281,843. Steam-Engine. Franklin D. Cummer, Detroit, Mich., Assignor to the Cummer Engine Company, Cleveland, O.
281,846. Lid for Miners' Lamps. John B. Deeds and William Mack, Terre Haute, Ind.
281,922. Rock-Drill. William H. Randall, San Francisco, Cal.
281,945. Ore-Roasting Furnace. James M. Thompson, San Francisco, Cal.
281,978. Rolling-Mill. Alfred Crandell, Pine Plains, N. Y.
281,982. Amalgamator. John T. Davis, Rahway, N. J., and Isaac Stead, Philadelphia, Pa.; said Davis Assignor to said Stead.

GRANTED JULY 31ST.

282,035. Device for Promoting Combustion in Furnaces. James F. Baker, Chicago, Ill.
282,041. Apparatus for Compressing Liquid Steel. John F. Bennett, Pittsburg, Pa.
282,042. Pump-Regulator. James H. Blessing, Albany, N. Y.
282,055. Wire-Coating for Drawing. Addison B. Clemence, Worcester, Mass.
282,064. Coke-Oven and Kiln. Friderich C. Eberley and Rudolph Richter, Denver, Colo.
282,071. Steam Motor-Engine. Harvey F. Gaskill, Lockport, N. Y.
282,073. Electric Ore-Separator. Herman Greve, St. Paul, Minn.
282,118. Production of Ferro-Phosphorus. Jacob Reese, Pittsburg, Pa.
282,131. Amalgamator. Hugh M. Thompson, St. Louis, Mo.
282,163. Mechanism for Moving Earth and Excavated Material. Howard A. Carson, Boston, Mass.
282,200. Elevated Wire Railroad. Smith H. Knapp and Alpheus E. Adams, Danbury, Conn.
282,218. Ore-Pulverizing Machine. Henry E. Parson, New York City.
282,265. Metal-Melting Furnace. George M. Bryant, Minneapolis, Minn.
282,266. Apparatus for Manufacturing Iron and Steel directly from the Ore. Henry Clay Bull, Liverpool, County of Lancaster, England, Assignor to Bull's Iron and Steel Company (Limited), same place.
282,274. Mining-Machine. Charles W. Colvin, Wilkes-Barre, Pa.
282,279. Metal Crucible. Mattison Darragh and Scudder H. Darragh, Bridgewater, Pa.
282,315. Furnace for the Manufacture of Iron and Steel and for other Purposes. James Henderson, Bellefonte, Pa.
282,342. Furnace for Distilling and Carbonizing Wood, etc. Jean A. Mathieu, Philadelphia, Pa.
282,349. External Friction Brake-Band for Hoisting Machinery, etc. Daniel H. Merritt, Marquette, Mich.
282,352. Amalgamator. Henry Moon, Thomasville, N. C.
282,382. Rock-Drilling Machine. Alfred Shedlock, Brooklyn, N. Y., Assignor to John D. Shedlock, same place.
282,387. Gas-Producer. Charles W. Siemens, Westminster, County of Middlesex, England.
282,440. Process of Distillation of Coal. William J. Cooper, Westminster, County of Middlesex, England.
282,464. Flux for Welding Metals. Wilhelm Mutter, Syracuse, N. Y.

FINANCIAL.

Gold and Silver Stocks.

NEW YORK, Friday Evening, Sept. 7.

This week has been one of the dullest that the mining market has yet experienced. With the exception of two or three fancy stocks, the transactions have been very small. Elko Consolidated has been the most active stock dealt in, and Robinson and Sonora Consolidated record large dealings. Prices have not materially changed either way. Below will be found a full summary of the market. The total number of sales aggregates 133,810 shares, as against 155,652 last week.

The Comstock shares were very quiet, and were steady. California sold from 26@24c. Consolidated Virginia was moderately dealt in, and was a little weak; it sold from 60@56c. Sierra Nevada was quiet and strong, selling from $4.25@$4.45. Union Consolidated sold from $4.90@$5.13@$5, with transactions of 225 shares. Sutro Tunnel was fairly dealt in at steady prices; it sold from 19@20c.

The Leadville stocks were also quiet and steady. Amie was irregular, under a small business, selling from 15@12@14c. Chrysolite was moderately dealt in at steady prices, selling from $1.10@$1.15. Breece sold at 20c. Iron Silver was quiet and strong, selling from $3@$3.10. Leadville sold at 30c. and Little Chief at 55@50c. The transactions in both were very small.

The Bodie stocks were almost neglected. Bodie sold at 70c. assessment paid, and from 16@12@15c. assessment unpaid. Standard was quiet and irregular, selling from $5.75@$5.25@$5.38.

The Tuscarora stocks were very quiet, with the exception of Elko. Grand Prize sold at 15c. Navajo was dealt in to the extent of 300 shares at $2.90. North Belle Isle was moderately dealt in at strong prices, selling from 40@50c. Elko Consolidated was very active, and at one time quite strong; it sold from 10@16@13c.

In the miscellaneous list, Alice was quiet and steady at $2. Bassick sold at $9, with one small transaction. Eureka Consolidated was quiet and strong, selling at $7.50. Gold Stripe was quiet and steady at 7@8c. Hall-Anderson was moderately dealt in at steady prices; it sold from $1@$1.10. Horn-Silver was quiet and strong, selling from $7@$7.25. Northern Belle sold from $6@$6.13, with a small business. Robinson Consolidated was active and irregular, selling from 46@40@48@47c. Sierra Grande was also irregular, under a small business, selling from $1.05@95@97c. Silver King sold from $7@$6.75.

Alta-Montana was quiet and steady at 5@6c. Barcelona was very quiet at steady prices, selling from 34@33c. Central Arizona sold from 24@25c., with a small business. Decatur sold at 2c. Eastern Oregon was very quiet and was quoted at weaker prices than of late; it sold from 76@75c. Sonora Consolidated was actively dealt in at steady prices; it sold from 27@25c.

A sale of 250,000 shares (a controlling interest) of the United Mining Company was announced to take place at the Real Estate Exchange Sales-Room on Wednesday last. We understand that 30,000 shares were sold, but that no actual transfer of property took place. The company owns four gold and silver mines in Grand County, Colorado, near the town of Teller.

A meeting of those stockholders of the Eureka Consolidated Mining Company who are in favor of a change in the management and of having a transfer-office in this city was held at the office of R. H. Rickard, No. 32 Pine street, on Wednesday last. The meeting was well attended, some 28,000 shares being represented, and Dr. Mackenzie was appointed to attend the annual meeting of the company in San Francisco on the 15th day of October next.

We have received some favorable news in regard to the Stormont Company. The secretary reports that the company is out of debt and has a surplus of about $14,000; and that it is netting from $1000 to $3000 per month at the present time.

MEETINGS.

Rappahannock Gold Mining Company, No. 60 Broadway, Room 15, New York City. Adjourned meeting of stockholders September 14th, at a quarter past four o'clock P.M.

DIVIDENDS.

The Castle Creek Mining Company, of Idaho, has declared its sixteenth regular monthly dividend of three per cent, payable September 17th.

The Dunkin Mining Company, of Colorado, has declared a dividend (No. 16) of five cents per share, or ten thousand dollars, payable October 1st.

The Plymouth Consolidated Gold Mining Company, of California, has declared a dividend (No. 4) of fifty cents per share, or fifty thousand dollars, payable immediately at the offices in New York and San Francisco.

The Standard Consolidated Mining Company, of California, has declared its monthly dividend of twenty-five cents per share, payable on September 12th, at the Farmers' Loan and Trust Company.

PIPE LINE CERTIFICATES.

Watson & Gibson, of No. 49 Broadway, report as follows on the petroleum market:

There has been but little activity during the past week except for a very brief time on Wednesday. The fluctuations were within so narrow a range that the public were not attracted to the market.

Under the report that Grandin No. 14, which is on the extreme southwestern limit of Balltown development, was showing for a large well, the market broke to $1.06⅞. This proving to be untrue, the market reacted to $1.08⅞ under free buying of shorts. The well is now yielding only about seven barrels per hour; and as the sand is said to be of poor quality, the bulls contend that it cuts off the extension of the Balltown pool in that direction. Some important wells are drilling on the northeastern end of Balltown, near Porcupine No. 9, which will test the territory. Until these wells are in, about a week hence, no bull movement in oil is likely. If they prove small, we may look for a spirited advance. Refined oil is 8⅛, a shade higher than a week ago.

Steps have been taken by the leading oil exchanges of the country to form a central organization for the purpose of insuring a uniformity of business methods and the protection of members. The plan is, to have a central organization, to be known as the Conference of Oil Exchanges. The exchanges which have approved the preliminary work are the Oil City, the Titusville, the Bradford, and the Pittsburg exchanges, and the New York Petroleum Exchange. Each of these institutions is to be entitled to three delegates to the conference, which is to meet on the third Thursday of June in every year. Future admissions of exchanges are to be classified as follows: First class, entitled to three delegates, exchanges whose clearances average 100,000,000 barrels per month for the three months preceding the date of application for admission; second class, two delegates, clearances 50,000,000 barrels per month; third class, all other exchanges, which shall be entitled to only one delegate. One of the most important features of the new plan is the provision that "any member of the several exchanges who may be suspended or expelled from either of the exchanges to which he belongs shall likewise stand expelled or suspended from all the exchanges to which he belongs." A suspended or expelled member of any one exchange will be ineligible to membership in any other exchange in the conference. At a meeting of the members of the New York Petroleum Exchange yesterday, the proposed plan was adopted, and S. F. String, D. R. Offley, and P. B. Crosby were selected as a committee to complete the details.

The following table gives the quotations and sales at the New York Mining Stock and National Petroleum Exchange:

		Opening.	Highest.	Lowest.	Closing.	Sales.
Sept.	1.....	$1.08¾	$1.09⅜	$1.08¼	$1.08⅜	1,742,000
	3.....	1.08½	1.08⅜	1.07½	1.08¼	1,672,000
	4.....	1.08⅛	1.08⅛	1.06¾	1.07⅜	1,641,000
	5.....	1.06⅞	1.08¾	1.06⅞	1.08¼	2,027,000
	6.	1.08⅞	1.08⅞	1.08¼	1.08⅜	1,953,000
	7.....	1.08½	1.08¼	1.07¾	1.08	1,311,000
Total sales.						10,346,000

Copper and Silver Stocks.

Reported by C. H. Smith, 15 Congress street, Boston, Stock Broker and Member of the Boston Mining and Stock Exchanges.

BOSTON, September 6.

The market for copper stocks the past week shows a little firmer tendency as to prices, but continues to rule dull and inactive. There is but little stock offering for sale at present prices, and it would be difficult to fill an order for any considerable amount of the dividend-paying mines, without advancing prices materially. At the same time, there is no disposition to traffic in the speculative mines, although some of them are undoubtedly very cheap at the prices at which they are offered for sale. Ingot copper holds firm at 15⅛@15¼c., and there are indications that higher prices will prevail during the ensuing fall and winter. Should this be the case, we shall, no doubt, have a more active market for all the copper stocks, and more active prices. Calumet & Hecla advanced from $240@$243 on small sales, with no stock offered to-day at less than $245. Franklin was also better, with sales at $9⅞@$10. The August product was 183 tons, a slight increase over the corresponding month of last year. Quincy continues in good demand, with sales at $46, which is also bid, none offered. A gain of 57 tons in the product for August, compared with last year, is reported, and the mine continues to look well. Osceola sold at $18, and Atlantic at $10, same as last week. Huron sold at $1 9-16 (100 shares only), the same being bid. This mine doubled its production in August, as compared with last year, and looks cheap at the price at which it is selling. Pewabic sold at $3. The product for August shows a falling off of about 15 tons from last year.

In silver stocks, there is but little doing and prices show no material change. Bonanza sold at $1⅛. Catalpa, 37½c. Sullivan, 87½c. Harshaw, 50c. Silver Islet, $3⅛@$3, and offered at the latter figure.

At the Boston Mining and Stock Exchange, there was no special feature. Prices for the stocks dealt in show but little change, and there is not much margin for operations. Bowman Silver steady at 17@18c. Massachusetts & New Mexico, 4@5c. Empire, 17c. bid. Dunkin, 29@30c. Sullivan is more active and in fair demand at 87½@92½c.; sales at the latter price, buyer 30.

3 P.M.—At the Board this afternoon, Huron sold at $1⅞, and closed $1¾ bid, $2 asked. Silver Islet sold at $3, closing $2¾ bid. Sullivan, $⅞@$1. Bowman Silver sold at 16c. Calumet & Hecla, $240 bid and $245 asked. Osceola, $17½@$20. Quincy, $46¼@$47¼. Franklin, $10. National, $1.

SAN FRANCISCO MINING STOCK QUOTATIONS.

Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS. Aug. 31.	Sept. 1.	Sept. 3.	Sept. 4.	Sept. 5.	Sept. 6.
Albion						
Alpha	2⅛	2⅛		2	2	2
Alta	.85	1	1	1⅜	1½	1¾
Argenta				.15	.15	
Bechtel						
Belcher	1		1⅛	1		
Belle Isle						.35
Best & Belcher	4	4¼	3¾	4	4	3⅞
Bodie	.15	.15	.15			.25
Bullion						
Bulwer						
California	.25	.25	.25	.25	.20	.25
Challar	2¼	2¼	2⅞	2¾	3	3⅛
Con. Virginia	.55	.60	.50	.55	.55	.55
Crown Point	1⅛		1⅛	1⅛	1¼	1¼
Elko Cons						
Eureka Cons		6⅞	7⅛	6¾	7	8
Exchequer						
Gould & Curry	2¾	2¾	2⅜	2¾	2¾	2⅝
Grand Prize	.20				.15	.52
Hale & Norcross	4⅜	4½	4	4	4½	4⅜
Independence						
Martin White						
Mexican	3¾	3¾	3½	3⅝	3½	3⅝
Mono						
Mount Diablo	4¼		4½		4½	
Navajo	2⅜	2⅜	2⅜	2⅜	2¾	2¾
Northern Belle	6⅛	6¼	6⅜	6⅛	6¼	6⅛
North Belle Isle						
Ophir	3⅝	3¾	3½	3½	3½	3⅝
Overman						
Potosi	.90	.90	.80	.80	.85	.87½
Savage	2	2⅛	1⅞	2	2	2
Scorpion	.60	.60	.60	.55	.55	.60
Sierra Nevada	3½	3¾	3½	3¼	3¼	3¼
Silver King						
Tip-Top						
Union Cons	5¼	5⅜	4⅞	4⅞	5	5
Utah	2⅞	3	2⅝	2⅝	2¾	2⅝
Wales Cons						
Yellow Jacket	3¼	3⅜	3⅛	3¼	3¼	3¼

BULLION MARKET.

NEW YORK, Friday Evening, Sept. 7.

DATE.	London. Pence.	N. Y. Cents.	DATE.	London. Pence.	N. Y. Cents.
Sept. 1	50⅝	109⅞	Sept. 5	50⅝	109¾@109⅞
3	50⅝	109⅞	6	50⅝	109⅞
4	50⅝	109⅞	7	50⅝	109⅞

Bullion Receipts at New York.—The bullion received from the mines at the various offices in this city during the week ended September 7th, as compiled from various sources, amounted to $193,000, as against

NEW YORK MINING STOCKS.

DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	Highest and Lowest Prices per Share at which Sales were Made.												SALES.
	Sept. 1.		Sept. 3.		Sept. 4.		Sept. 5.		Sept. 6.		Sept. 7.		
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Alice, Mon							2.00				2.00		150
Amie Con., Co			.14	.13	.15	.12			.13		.14		3,300
Argenta, Ne													
Bar. & Walker, Ut													
Bassick, Co	9.00												50
Belle Isle, Ne													
Bodie Cons., Ca					.16		.70	.12	.70	.15	.70		1,550
Breece, Co					.20						.19		1,500
Bulwer, Ca													
California, Ne					.26		.26		.25	.24			3,000
Cal. & Hecla, Mich													
Carbonate Hill													
Caribou Con., Co													
Chrysolite, Co			1.15				1.10		1.10		1.15		2,500
Cons. Va., Ne			.71	.58			.60	.58	.58	.57	.58	.56	4,410
Crown Point													
Deadwood-Terra, Dk													
Dunkin, Co											.30		300
Eureka Cons., Ne					7.50								300
Excelsior, Ca													
Father de Smet, Dk													
Findley, Ga							.09		.07				1,000
Gold Stripe, Ca			.07		.07				.08				800
Gould & Curry, Ne													
Grand Prize, Ne					.15								5
Great Eastern, Dk													
Green Mountain, Ca													
Hale & Norcross, Ne													
Hall-Anderson, N. S	1.00								1.05		1.10	1.05	2,300
Hibernia, Co													
Homestake, Dk											19.00		100
Horn-Silver, Ut	7.00		7.25		7.25		7.25						540
Hukill, Co													
Independence, Ne													
Iron Silver, Co			3.05		3.00						3.10	3.00	1,525
La Plata, Co													
Leadville C., Co	.30		.30		.30				.30				500
Little Chief, Co	.55										.59		300
Little Pittsburg, Co													
Martin White, Ne													
Moose, Co													
Navajo, Ne									2.90				340
Northern Belle, Ne	6.00				6.13								800
North Belle Isle, Ne	.40		.48				50	.48			.50		2,000
Ontario, Ut									32.00				200
Opair, Ne													
Plumas, Ca													
Prussian, Colo													
Quicksilver Pref., Ca											33.00		100
" Com., Ca													
Rising Sun, Ca									.01				6,000
Robinson Cons., Co	.46		.45	.40	.43	.42	.42		.42		.48	.44	13,450
Saint Joseph's Lead													
Savage, Ne													
Sierra Grande, N. M	1.05		.97	.95	1.05	.96			1.00		.97		2,100
Sierra Nevada, Ne	4.25								4.30		4.45	4.30	460
Silver King, Ar	7.00				6.75								45
Spring Valley, Ca													
Standard, Ca	5.50		5.75		5.63				5.50		5.50	5.25	550
Stormont, Ut													
Tip Top, Ar													
Tombstone, Ar													
Vizina, Ar							.55		.15				300
Yellow Jacket													

NON-DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	Highest and Lowest Prices per Share at which Sales were Made.												SALES.
	Sept. 1.		Sept. 3.		Sept. 4.		Sept. 5.		Sept. 6.		Sept. 7.		
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Albion	.06						.05				.06	.05	7,400
Alta-Montana, G													
Am. Flag, S													
Barcelona, G	.34		.34	.33	.34				.24	.23			1,900
Bear Creek													
Bechtel Con., G													
Belvidere													
Best & B'licher, G. S													
Big Pittsburg, S. L													
Bradshaw, S													
Buckeye							.25						1,000
" pref													
Bull-Domingo, S.L													
Bye and Bye													
Calaveras, G													
C'lav'r's W.&M.Co													
Cal., B. H., G													
Central Ariz'na, S			.24									.25	200
Cherokee, G													
Climax, Co													
Cons. Imp'ri'l, G.S													
Crowell, G													
Dahlonega, G											.03		1,500
Decatur	.02						.02				.02		1,900
Dunderberg													
Durango, G							.05				.05		300
Eastern Oregon	.76						.73				.75		1,900
Elko Cons	.11	.10	.12	.10	.16	.11	.15	.13	.14	.13	.13		59,000
Enterprise													
Fannie Barret													
Globe Copper													
Gold Placer, G													
Goodshaw, G													
Granville, G													
Harlem M.& M.Co													
Hortense, S													
Imperial													
Lacrosse, G													
Lucerne													
Mariposa Prel., G													
" Com., G													
Mexican, G. S													
Miner Boy													
Mono													
North Standard, G													
N. Horn-Silv'r, S L													
Ori'nt'l & Miller, S													
Parnell													
Quartz Creek													
Rappahannock, G													
Red Elephant, S													
Ruby, of Arizona													
Silver Cliff, S													
Sonora Con	.27	.26	.26	.25	.26						.25		10,700
South Bodie, G													
South Bulwer, G													
South Hite													
South Pacific													
State Line, 1 & 4, S													
" Nos. 2 & 3, S											.03		100
Sutro Tunnel	.19		.20		.20	.19	.20				.20		9,700
Taylor Plumas													
Tioga													
Unadilla, S											.02		1,000
Union Cons., G. S	4.90										5.15	5.00	225

Full tables giving the total amount of dividends, capital, etc., will be printed the first week of each month. Dividend shares sold, 33,945. Non-dividend shares sold, 90,825.

BOSTON MINING STOCKS.

	Aug. 31.		Sept. 1.		Sept. 3.		Sept. 4.		Sept. 5.		Sept. 6.		Sales.
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Allouez													
Amie													
Atlantic			10.00		10.00								65
Aztec													
Bodie Con													
Bonanza D	1.50		1.56¼										200
Bowman Sil	.18		.18		.18								3,300
Bruns. Ant													
Bulwer													
California													
Cal. & Hec	240		240				243						36
Catalpa	37½		37½	36									2,200
Central Ariz													
Climax													
Co. Virginia					.60								200
Copper F'lls													
Copperop													
Crescent	.12												200
"Cusi"													
Decatur													
Deer Isle	.05												200
Denver City													
Douglas	.40												100
Duncan											.15		100
Dunkin	.26		.30	.29	.30								700
Empire			.17		.18								800
Eureka Con			7.00										10
Franklin					10.00	9.88					9.88		300
Gila County													
Harshaw			.50		.50								600
Huron									1.56¼		1.88		200
Independence													
Indian Q'n													
Little Pitts													
Mammoth													
Mass.& N.M	.05				.05								11,300
Milton													
Napa			3.00										50
National							.75						100
North. Belle					6.00								20
Ontario													
Osceola	18.00		18.00				18.00						28
Penn-Breck													
Pewable							3.00						10
Pine Tree													
Plymouth													
Quicks.,com													
Quincy					45.50		46.00	45.00	46.00				245
Robinson	.50												100
San Pedro					.17		.17						300
S'ra Nevada													
S'ra Grande													
Silver Islet							3.50				3.00		550
Silver King													
Simpson Gd													
So. Pacific													
Standard													
Sullivan	.82½				.90				.87½				600
Sutro Tun	.19		.19										300
Sycamore													
Twin Lead													
Vizina													

PHILADELPHIA MINING STOCKS.

	Aug. 31.		Sept. 1.		Sept. 3.		Sept. 4.		Sept. 5.		Sept. 6.		Sales.
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Amer. Cons.													
Argent	.14	.13	.14	.11	.12	.11	.12	.11	.13	.12	.12		24,450
Aztec													
Battle Mt													
Buena													
California													
Calista													
Chrysolite													
Cincinnati	.09	.08	.08	.07	.08		.08	.07	.08	.07	.07		10,900
Comprom'e	.16		.16		.15		.16	.15			.15		16,000
Contention													
Con. Virg													
Dauntless			.02						.01		.02		4,800
Del Monte									.03				600
Denver City							.10						100
Eureka													
Girard					.01						.02		3,100
Governor					.02		.02				.03		8,900
Grand Uni'n			.03				.03		.03		.03		31,500
Green Mt													
Gunnison	.32½		.25		.25		.25						1,500
Homestake													
Horn Silver													
Iowa Gulch	.05		.05				.05		.05		.04		16,300
Iron Silver													
King Sul'on													
Ledger Con													
Little Dia'd	.07		.07		.07		.07				.07		8,200
Little Maud													
Little Pitts													
L'g & D'y H													
Montana													
Mt. Sheridan	.03		.03				.03				.04		8,600
National													
North'n B'l													
Orion													
Orion Pref													
Palmetto E													
Pembina					.11				.10				600
Penn-Breck	.11	.10	.11	.10			.10	.09	.09		.09		15,700
Permanent					.02								500
Pizarro													
Pizarro Ex													
Potosi													
Rara Avis					.16	15							200
Rara Avis E	.11		.11		.11		.10				.10		12,400
Record													
Rico Pion'r													
Sierra Apac					.20				.22		.20		1,400
Sierra Be.la					.55				.57½				2,600
Sierra G'nde	1.67½	1.00	1.00	.92½	.95	.92½	1.02½	.97½	1.00	.97½	1.02½	.97½	19,900
Sierra Nev													
Silver Cord					1.55				1.55				500
Silver King													
Silv'r Plume	.01								.01				14,000
Sonora Con													
Standard													
Sultana	.02				.02		.02						18,000
Sutro Tun'l							.20						100
Tombstone							.95	.92½					800
Victor													
Yale Mt													

$222,000, reported for the previous week. The receipts from January 1st, 1883, to date are $7,806,974.

Exports and Imports of Gold and Silver at New York.

Exports.

Week ended September 1st	$465,047
Corresponding week last year	254,720
Since January 1st, 1883	9,378,176
Corresponding period last year	43,466,267

Imports.

Week ended September 1st	$638,717
Corresponding week last year	195,375
Since January 1st, 1883	10,241,491
Corresponding period last year	2,579,027

Foreign Bank Statements.—The governors of the Bank of England, at their regular weekly meeting, made no change in the bank's minimum rate for discount, and it remains at 4 per cent. During the week, the bank gained £107,000 bullion, and the proportion of its reserve to its liabilities was raised from 47 9-16 to 47 11-16 per cent, against 39¼ per cent at this date a year ago. September 6th, the bank gained £50,000 bullion on balance. The weekly statement of the Bank of France shows losses of 380,000 francs gold and 1,076,000 francs silver.

BULLION PRODUCTION FOR 1883.

We give below a statement showing the latest bullion shipments. These are officially obtained from the companies, where that is possible; and where official statements can not be procured, we take the latest shipments published in those papers nearest to the mines reported. The table gives the amount shipped for the week up to the date given, as well as the aggregate shipments to such date from the first of January, 1883.

The shipments of silver bullion are valued at $1.29·29 per ounce troy; gold at the standard $20.67 per ounce troy. The actual value of the silver in the following table is therefore subject to a discount, depending on the market price of silver. If the price of silver be counted at $1.11 an ounce, which has for some months been about its average value, the following figures, where they relate to silver bullion, should be diminished by about 14⅛ per cent, to arrive at actual value.

Mines.	States.	Month of July.	Year from Jan. 1st, 1883.
*Alice, G. S.	Mont.	‡$97,128	$568,441
*Alta-Montana, G. L. S.	"		$10,625
*Belmont	"		12,604
Bodie, G. S.	Cal.	12,447	161,728
Bodie Tunnel, G.	"		52,742
*Bonanza King, G.	"	45,211	379,434
*Boston & Montana, G.	Mont.		123,556
*Central Arizona, S.	Ariz.		35,845
*Christy, S.	Utah.	16,842	162,513
*Chrysolite, S. L.	Colo.	16,253	262,929
Consolidated Bobtail	Colo.		18,723
*Contention, S.	Ariz.	77,985	635,413
Crescent, G.	Cal.		13,000
*Custer, G. S.	Idaho.		43,572
*Deadwood-Terra, G.	Dak.		172,277
*Derbec Blue Gravel, G. S.	Cal.	17,122	72,270
Dunkin, S. L.	Colo.		32,015
Evening Star, S. L.	Colo.		47,061
*Father de Smet, G.	Dak.	30,688	208,851
*Frisco M. and S. Co., G. S. L.	Utah.		§77,084
Gunnell, S.	Colo.		58,828
*Head Center Consolidated	Ariz.	1,867	28,368
*Head Center and Tranquillity	Ariz.	19,578	80,198
*Hecla Consolidated, G. S.	Mont.		293,922
*Homestake, G.	Dak.		419,148
*Hope, S.	Mont.	20,434	62,447
Horn-Silver, S. L.	Utah.	300,000	1,847,000
*Howell S. and Mg. Co., G. S. L.	Ariz.	$41,361	41,361
Idaho, G.	Cal.		88,642
*Independence, G. S.	Nev.		32,991
Iron Silver, S. L.	Colo.		503,831
*Jocuistita, S.	Mex.		‡228,022
*Kentuck, G. S.	Nev.	2,535	15,412
*Lexington, S.	Mont.	106,068	744,556
*Little Pittsburg, S. L.	Colo.	6,446	42,091
*Marguerite, G.	Cal.		45,745
*Martin White, G. S.	Nev.		136,317
Morning Star, S. D.	Colo.		84,428
*Moulton, G. S.	Mont.		123,288
Mount Diablo	Nev.	74,277	262,100
*Navajo, G. S.	"		411,642
*North Belle Isle	"		2,153
Northern Belle, S.	"	51,134	447,040
*Ontario, S. L.	Utah.		1,038,687
*Oxford, G.	N. S.	5,276	40,531
*Phœnix, G.	S. C.	3,000	10,700
*Pinal Consolidated, S. L.	Ariz.		181,485
*Satemo, G.	N. S.		2,500
*Silver Bow, G. S.	Mont.		101,241
*Silver Cord, G. S. L.	Colo.	69,359	703,333
Standard, G.	Cal.	95,209	738,401
Star, S.	Nev.		27,095
*Stormont, S.	Utah.	20,801	152,728
Syndicate, G.	Cal.	9,300	38,428
Tintic M. and M. Co.	Utah.	10,595	25,196
*Tip Top, S.	Ariz.	10,009	37,868
*Tombstone, G. S. L.	"	82,960	497,196
Wyoming Consolidated	Cal.		31,541
Yellow Jacket, S.	Nev.	72,227	265,885
Total amount of shipments to date			$12,983,020

* Official. † Net value. ‡ Assay value. § Not including value of lead. *G.* Gold. *S.* Silver. *L.* Lead.

United States Assay-Office at New York.—Statement of business for the month ended August 31st, 1883:

Deposits of gold:		
Foreign coin	$1,037,000	
Foreign bullion	53,000	
United States bullion	520,000	
United States bullion (re-deposits)	109,000	
Jewelers' bars	86,000	
Refined gold	121,000	$1,926,000
Deposits of silver:		
Jewelers' bars	19,500	
United States coin	300	
Foreign coin	8,700	
Foreign bullion	11,500	
United States bullion (contained in gold)	8,000	
Bullion, Arizona	4,400	
Colorado	27,700	
Dakota	100	
Idaho	3,900	
Lake Superior	1,300	
Montana	127,200	
New Mexico	35,800	
Utah	98,500	
Refined silver	51,600	393,500
Total deposits		$2,319,500
Gold bars stamped	$678,299	
Silver "	237,020	915,320

METALS.

NEW YORK, Friday Evening, Sept. 7.

Copper.—There have been sales during the week of about 200,000 pounds at 18⅛@18¼c., the latter for wire bars, and 18¼c. is now quite freely insisted upon. A better feeling prevails generally, and in other brands than Lake, slightly higher figures have been realized. We quote 14⅛@14⅝c., according to brand.

England is lower, cabling £69 for Best Selected and £63 7s. 6d. for Chili Bars.

Tin.—A fair business has been done during the week, and prices here keep up well in spite of weaker markets in London, whence cables come showing £94. Singapore, on the other hand, is higher, parity £95 15s., a rise due to the buying of Chinese parties in that market in anticipation of war with France, growing out of the Annam troubles. Here Straits is quoted 21⅛c. spot cash; Australian, 21⅛c.; Billiton, 21¼; and Banca, 21⅛c.

Lead.—Holders are stiffening, and have advanced their asking price from 4·30c. to 4·35c. It would be a difficult matter to secure any round lots for less at the present time. On the other hand, however, any attempt to put a good-sized lot on the market would be impossible without making concessions. The course of the market in the near future will largely depend upon whether holders maintain an unbroken front.

From St. Louis, Messrs. John Wahl & Co. wire us as follows:

There is a somewhat better feeling, due to growing inquiry. The market is very steady at some advances on last week's quotation, with a good demand for refined lead. We note sales of 130 tons of Hard lead at 4·05c., and quote Refined 4·10c. Our receipts are 1000 tons this week, the same as last week.

Messrs. Everett & Post, of Chicago, telegraph:

Our market is strong and the demand good. Buyers are taking lead liberally. We quote nominally 4·12½@4·15c.

Spelter.—The flooding of a number of mines in the Joplin District has made ore scarcer and dearer; and on the other hand, the low prices have caused the closing down of works. There have been sales during the week at 4½c., which we quote. England cables unchanged, £15 for Silesian.

We call the attention of those interested in spelter to the admirable paper of Mr. F. L. Clerc, the first installment of which we print elsewhere.

Antimony.—This metal is quiet and dull.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, Sept. 7.

According to the figures published in a supplement of the New York Metal Exchange, the total stocks in bond in the ports of New York, Philadelphia, Boston, Baltimore, and New Orleans were as follows:

	Sept. 1, 1882.	Jan. 1, 1883.	Aug. 1, 1883.	Sept 1, 1883.
	Tons.	Tons.	Tons.	Tons.
Pig-iron	6,927	6,330	3,735	7,261
Spiegel iron	1,514	4,131	1,426	467
Old rails	15,396	5,504	2,204	171
Scrap iron	585	1,384	3,147	157
Scrap steel	718	456	306	306
New iron rails	7,450	6,642	376	355
New steel rails	3,008	4,816	....	121
Grand total	35,598	29,263	11,194	11,818
Increase during August, 1883				624
Decrease during 12 months				23,780

American Pig.—September thus far has been a severe disappointment. There is no use in denying that the evidences of an improvement in August, which were so carefully nursed and were made so much of, have again disappeared. It is true that many furnaces are out of blast, and yet it is true also that the production is still ahead of the requirements. The excess, it is true, is not great, but still there is an excess, so that even No. 1, which for a while was scarce, can now be obtained without difficulty. There is not much shading of prices, however, chiefly for the reason that it is not believed that lower figures would tempt buyers. The fact is, that consumption is very much narrowed down. Eastern consumers who supply the mills with machinery and castings are doing very little business. The great car manufacturing establishments and the many other works which supply the railroads are doing comparatively little. The stove trade is only moderately active, and the only branch in which there is unusual activity is the pipe-makers, who are as busy as they can be, and are behind in their orders. This is not a glowing picture, but we believe that it closely reflects the condition of the trade.

Mr. Edward J. Shriver, Secretary of the Metal Exchange, has the following returns from 91 furnaces:

	No. 1.	No. 2.	Bessemer Forge and lower grades.	Grade not specified.	Total.
Stocks Aug. 1	14,738	21,998	44,014	4,468	85,218
" Sept. 1	14,852	20,891	36,913	5,329	77,985
Production in July	8,105	5,655	8,702	5,452	27,974
" " Aug.	7,798	3,947	4,400	7,218	23,363

These figures are encouraging so far as the supply is concerned, but they do not invalidate the above statement, which is based upon the shrinkage of the demand.

Transactions during the week have been on a moderate scale. We quote No. 1 Foundry, $21.50@$23; No. 2, $19@$21, according to quality; and Gray Forge, $18.25@$19.50, all at tide-water. Bessemer Pig is lifeless, and Spiegeleisen is quiet at $30.50@$30.75 for 20 per cent, at which figure a 1000-ton lot changed hands. Lower grades are dull at $25@$25.50.

At the Exchange, the following sales were reported: Saturday, 200 tons No. 1, January, $22.25; Monday, 300 tons No. 1, December, $22; Thursday, 200 tons No. 1, December, $21.87½, and 200 tons No. 1, January, $22; and to-day, 500 tons No. 1 at $22.25.

Scotch Pig.—Though the arrivals have been moderate, a considerable portion has gone into store, an indication of the fact that it is difficult to place the metal at current figures, which are still quite firmly adhered to. Freights are cabled lower, 4s. 6d. from Glasgow.

We quote ex ship: Coltness, $23.50@$24; Langloan, $23@$24; Summerlee, $23; Dallmellington, $21@$21.50; Eglinton, $20.50@$21; and Glengarnock, $22.50@$23.

At the Exchange, the following slightly lower cable quotations were received: Coltness, 60s.; Langloan, 59s.; Summerlee, 56s. 6d.; Gartsherrie, 56s. 6d.; Glengarnock, at Ardrossan, 55s.; and Eglinton, at Ardrossan, 48s. 6d. Warrants to-day were 46s. 5d.

Steel Rails.—Very little business has been done, outside of small lots, of which some were placed for prompt delivery at $37.50 at mill, which is equal to about $39 at tide. In the pending large orders, nothing has been done, buyers' and sellers' views being too far apart.

Old Rails.—There have been sales of some small lots at better figures, and $23.50@$24 is now asked for Ts.

Scrap Iron.—Very little has been done, quotations remaining $23.50 ex ship.

Philadelphia. September 7.

There is a tendency to better prices in iron and steel. A number of large buyers have purchased for from thirty to sixty days' requirements. Lowest prices have been reached.

Pig-Iron.—Special brands have been moving rather more freely during the past few days at $22.50@$23.50. Sales of about 2000 tons of Standards in 50 to 100-ton lots were heard of at $22@$22.50. Some movement in inferior No. 1 is reported at $21.50. No. 2 continues dull, but some business was closed at $19.50@$20. Two or three makes are still held at $21. More activity may be reported in mill irons at $19@$20 delivered, and a fair amount of business is now about to be closed at about $19. Some inquiries are for 1000-ton lots. Dealers in Scotch report more business for the week, but prices lower. Bessemer can not be moved at tide-water rates, $21.

Charcoal Blooms are worth $57.50 and anthracite $10 less.

Muck Bars.—Bars range from $33.50 to $35 asked.

Merchant Iron.—Only a quiet steady demand is reported at 2·15@2·20c. for Refined, and 2@2·10c. for not first-class. Local mills are working full-time, but with very little business for October, hence prices can not be regarded firm. Western iron is coming this way at from 2@2·10c., and has a disquieting effect, mainly in preventing large transactions. Skelp is not active, though negotiations are pending for large lots.

Plate and Tank.—The favorable situation continues, and large and small transactions are frequent at 2·35@2 50c. for Boat and Tank iron ; 3c. for Shell iron ; 4@4¼c. for Flange ; and 5@5½c. for Fire-Box. Requirements which were withheld during August are now coming forward.

Structural Iron.—A few orders were placed for small lots, early delivery, at 2·40@2½c. for Angles ; 2·75c. for Tees ; 3½c. for Beams and Channels.

Sheet-Iron.—The sheet-mills are securing their full share of business at card rates, being 4@4½c. for Common. Galvanized deliveries for building requirements are large.

Wrought Pipes and Tubes.—Two or three inquiries are on hand this week for large requirements. The local establishments are busy. Boiler tubes are generally quoted 60 off, and gas and steam pipe 70@75, according to order.

Steel Rails.—Small business is coming along. Large orders are likely to be placed any time ; but, for unexplained reasons, there is a delay. Quotations for winter delivery $37@$37.50 ; fall, $38@$38.50 ; light sections, $40@$41.

Old Material.—Offers at $24 by sellers for large lots. Bids at $23. Double Heads held at $26. No orders.

Scrap.—Cargo nominally $23.50. Yard No. 1, $24@$25. Nothing worthy of note doing.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, Sept. 7.

Anthracite.

The situation has not materially changed since our last report. Coal continues abundant, and as the few buyers there are are cautious, there is a constant pressure to move a surplus. That there can be no real improvement in the prices so long as such a condition of affairs lasts, will be patent to any one. The fact, too, that dealers are largely supplied and are expecting considerable coal still to be delivered, does not encourage the belief that the trade will witness the usual fall activity. The news from the iron trade is discouraging, and from Eastern manufacturing centers the frequently repeated tale of dullness is repeated. The early future must decide whether it will be possible to continue full work during the rest of the year. Two of the companies will probably, from special reasons—on account of heavy deliveries, or the facilities offered for pushing coal Westward—resist any such change in the programme ; but there is little doubt that they too will feel the pressure as soon as the markets begin to contract with the beginning of winter.

The Western Association will meet in Chicago next week, with the object of patching up some of the differences there. How far the attempt to keep the trade in order will be successful, remains to be seen.

Bituminous.

There is a very sharp competition for what little trade there is, and cutting is apparently indulged in quite liberally.

STATISTICS OF COAL PRODUCTION.

Comparative statement of the production of anthracite coal for the week ended September 1st, and year from January 1st :

TONS OF 2240 LBS.	1883. Week.	1883. Year.	1882. Week.	1882. Year.
Wyoming Region.				
D. & H. Canal Co..	104,005	2,533,162	55,187	2,235,331
D. L. & W. RR. Co.	129,058	3,199,182	78,501	2,930.636
Penna. Coal Co.....	36,695	918,238	24,005	886,623
L. V. RR. Co.....	42,899	902,771	14,123	710,713
P. & N. Y. RR. Co..	4,831	137,562	2,964	128,778
C. RR. of N. J	*	1,202,078	.....	1,513,984
Penna. Canal Co....	15,518	282,087	.....	291,116
North & West Br. RR.....	†	288,129	.....	.....
	332 006	9,463,209	174,780	8,697,171
Lehigh Region.				
L. V. RR. Co.....	118,338	3,201,863	64,742	3,078,373
C. RR. of N. J.....	*	1,126,889	.....	1,445,141
S. H. & W. B. RR..	†	37,175	.....	41,996
	118,338	4,365,927	64,742	4,565,510
Schuylkill Region.				
P. & R. RR. Co.....	292,565	5,570,315	106,785	4,324,429
Shamokin & Lykens Val.....	34,046	950,363	30,105	815,696
	326,611	6,520,678	136,890	5,140,125
Sullivan Region.				
St Line&Sul.RR.Co.	1,642	41,540	1,092	37,694
Total	778,597	20,391,354	377,504	18,440,500
Increase.....	.....	1,950,854	.....	.....
Decrease.....	.....	.....	.....	.....

* Included in tonnage of the Philadelphia & Reading Railroad. † Reports have not been received.

The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

Total same time in 1878.....10,737,415 tons.
" " " " 1879.....16,972,754 "
" " " " 1880.....14,216,454 "
" " " " 1881.....18,033,921 "

The increase in shipments of Cumberland Coal over the Cumberland Branch and Cumberland & Pennsylvania railroads amounts to 594,558 tons, as compared with the corresponding period in 1882.

Belvidere-Delaware Railroad Report for the week ended September 1st :

	Week.	Year. 1883.	Year. 1882.
Coal for shipment at Coal Port (Trenton)	2,926	75,716	58,748
Coal for shipment at South Amboy.....	16,148	516,363	558,332
Coal for distribution.....	18,097	523,063	470,810
Coal for company's use	2,325	103,627	84,422
Total.....	39,496	1,218,761	1,172,312
Increase...	.....	46,457	.....
Decrease.....	.....	.....	.....

The Production of Bituminous Coal for the week ended August 25th was as follows :

Tons of 2000 lbs., unless otherwise designated.

	Week. Tons.	Year Tons
Cumberland Region, Md.		
Tons of 2240 lbs..... 55,742		1,550,651
Barclay Region, Pa.		
Barclay RR., tons of 2240 lbs. 8,021		203,090
Broad Top Region, Pa.		
Huntingdon & Broad Top RR.... 4,242		118,825
East Broad Top..... 315		26,715
Clearfield Region, Pa.		
Snow Shoe..... 4,085		151,280
Tyrone and Clearfield..... .... .43,594		1,802,129
Alleghany Region, Pa.		
Pennsylvania RR.. 7,668		281,204
Pittsburg Region, Pa.		
West Penn RR..... 6,262		267,010
Southwest Penn. RR..... 1,736		68,316
Penn & Westmoreland gas-coal, Pa. RR 27,241		885,181
Pennsylvania RR 16,150		369,786
Total.... 175,056		5,724,187

The Transportation of Coke over the Pennsylvania Railroad for the week ended August 25th, and year from January 1st :

Tons of 2000 lbs.	Week.	Year.
Penn. RR. (Alleghany Region).....	804	55,467
West Penn. RR	1,458	67,295
Southwest Penn. RR ... .41,670		1,377,599
Penn. & Westmoreland Region, Pa. RR 3,847		144,093
Pittsburg, Penn. RR..... 667		1,168
Snow Shoe (Clearfield Region)..... . 252		12,458
Total. 48,698		1,628,080

Wholesale Prices of Bituminous Coal.

Clearfield, at Philadelphia..... .. ..$3.00@$3.25	
" " South Amboy..... 3.30@ 3.50	
" " New York, alongside..... 3.05@ 3.75	
Cumberland, at Baltimore..... 2.90@ 3.00	
" " Georgetown... .... 2.75@ 3.00	
" " Philadelphia..... 3.25@ 3.30	
" " South Amboy..... ... .. 3.80@ 4.00	
" " New York, alongside... .. 4.00@ 4.40	

Circular Prices of Anthracite Coal Delivery, f. o. b., at Tide-Water Shipping Ports, per ton of 2240 lbs.

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
WYOMING COAL.	$	$	$	$	$	$
Pittston at Newburg.....	3 95	3 95	3 90	4 10	4 40	4 40
Scranton at Hoboken..... .	3 90	3 90	4 00	4 30	4 70	4 80
Lackawanna at Weehawk'n	3 90	3 90	4 00	4 30	4 70	4 80
Wilkes-Barre at P. Johnston	3 90	3 90	4 00	4 30	4 70	4 50
Plymouth R. A. at P. John.	.....	....	4 25	4 50	5 25	4 75
LEHIGH COAL.						
Honey Brook at Fort John.	5 00	4 35	....	4 50	4 70	4 50
Fulton at South Amboy....	5 25	4 40	.....	4 40	4 30	4 40
U. L. & Coun. Ri'ge at Eliz'pt	.....	....	.....	.....	... .	....
SCHUYLKILL COAL. *At Elizabethport.*						
Hard White Ash.....	4 85	4 85	....	4 40	4 80	4 50
Free-Burning White Ash...	.....	3 90	.....	4 30	4 80	4 50
Schuylkill Red Ash.....	.....	.....	.....	4 40	5 05	4 50
Shamokin.....	.....	.....	.....	4 55	5 05	4 60
Lorberry.....	.....	.....	.....	4 70	5 25	4 60
Lykens Valley (Brookside).	.....	.....	5 10	5 40	5 75	5 40
At Port Richmond, Philadelphia, for shipment to points beyond Capes of the Delaware.						
Hard White Ash.....	4 50	4 50	3 90	4 05	4 50	4 15
Free-Burning White Ash...	.....	3 65	3 65	3 95	4 50	4 15
Schuylkill Red Ash	.....	.....	...	4 05	4 70	4 15
Shamokin....	.....	.....	.....	4 20	4 70	4 25
Lorberry....	.....	.....	...	4 20	4 75	4 25
Lykens Valley (Brookside).	.....	.....	4 60	4 90	5 25	4 90

Jermyn coal, at Hoboken, is quoted per ton of 2240 lbs.: Lump, $3.90; Steamer, $3.90; Broken (grate), $3.90; Egg, $4.15; Stove, $4.45; Chestnut, $4.45; Chestnut, No. 8, $4.45; Chestnut, No. 9, $4.45; Chestnut, No. 10, $4.45; Chestnut, No. 11, $4.45; Chestnut, No. 12, $4.45; Chestnut, No. 13, $4.45; Chestnut, No. 14, $4.45; Chestnut, No. 15, $4.45; Chestnut, No. 16, $4.45; Chestnut, No. 17, $4.45; Chestnut, No. 18, $4.45; Chestnut, No. 19, $4.45; Chestnut, No. 20, $4.45; Chestnut, No. 21, $4.45; Chestnut, No. 22, $4.45; Chestnut, No. 23, $4.45; Chestnut, No. 24, $4.45; Chestnut, No. 25, $4.45; Chestnut, No. 26, $4.45; Chestnut, No. 27, $4.45; Chestnut, No. 28, $4.45; Chestnut, No. 29, $4.45; Chestnut, No. 30, $4.45; Chestnut, No. 31, $4.45; Chestnut, No. 32, $4.45; Chestnut, No. 33, $4.45; Chestnut, No. 34, $4.45; Chestnut, No. 35, $4.45; Chestnut, No. 36, $4.45; Chestnut, No. 37, $4.45; Chestnut, No. 38, $4.45; Chestnut, No. 39, $4.45; Chestnut, No. 40, $4.45; Chestnut, No. 41, $4.45; Chestnut, No. 42, $4.45; Chestnut, No. 43, $4.45; Chestnut, No. 44, $4.45; Chestnut, No. 45, $4.45; Chestnut, No. 46, $4.45; Chestnut, No. 47, $4.45; Chestnut, No. 48, $4.45; Chestnut, No. 49, $4.45; Chestnut, No. 50, $4.45; Chestnut, No. 51, $4.45; Chestnut, No. 52, $4.45; Chestnut, No. 53, $4.45; Chestnut, No. 54, $4.45; Chestnut, No. 55, $4.45; Chestnut, No. 56, $4.45; Chestnut, No. 57, $4.45; Chestnut, No. 58, $4.45; Chestnut, No. 59, $4.45; Chestnut, No. 60, $4.45; Chestnut, No. 61, $4.45; Chestnut, No. 62, $4.45; Chestnut, No. 63, $4.45; Chestnut, No. 64, $4.45; Chestnut, No. 65, $4.45; Chestnut, No. 66, $4.45; Chestnut, No. 67, $4.45; Chestnut, No. 68, $4.45; Chestnut, No. 69, $4.45; Chestnut, No. 70, $4.45; Chestnut, No. 71, $4.45; Chestnut, No. 72, $4.45; Chestnut, No. 73, $4.45; Chestnut, No. 74, $4.45; Chestnut, No. 75, $4.45; Chestnut, No. 76, $4.45; Chestnut, No. 77, $4.45; Chestnut, No. 78, $4.45; Chestnut, No. 79, $4.45; Chestnut, No. 80, $4.45; Chestnut, No. 81, $4.45; Chestnut, No. 82, $4.45; Chestnut, No. 83, $4.45; Chestnut, No. 84, $4.45; Chestnut, No. 85, $4.45; Chestnut, No. 86, $4.45; Chestnut, No. 87, $4.45; Chestnut, No. 88, $4.45; Chestnut, No. 89, $4.45; Chestnut, No. 90, $4.45; Chestnut, No. 91, $4.45; Chestnut, No. 92, $4.45; Chestnut, No. 93, $4.45; Chestnut, No. 94, $4.45; Chestnut, No. 95, $4.45; Chestnut, No. 96, $4.45; Chestnut, No. 97, $4.45; Chestnut, No. 98, $4.45; Chestnut, No. 99, $4.45; Chestnut, No. 100, $4.45.

Horsford's Acid Phosphate.

Excellent Results.

Dr. J. L. WILLIS, Eliot, Me., says : "Horsford's Acid Phosphate gives the most excellent results."

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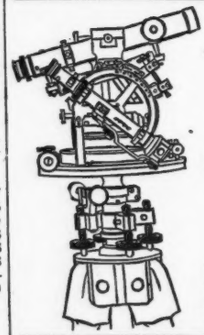

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